CEDAR ROUGHS WILDLIFE AREA MANAGEMENT PLAN

Approved by:

Robert W. Floerke, Regional Manager _____ Date _____

California Department of Fish and Game, Central Coast Region
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ACKNOWLEDGMENTS

This Plan is the product of a joint effort by the Department of Fish and Game (DFG) and the University of California Davis (UCD), Department of Environmental Science and Policy (DESP), Natural Reserve System (NRS) and Information Center for the Environment (ICE). The core project team included the following individuals (in alphabetical order by last name):

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LIST OF TERMS

The following acronyms and defined terms are used in this Plan with the meanings that are indicated below:

BLM	U.S. Department of the Interior, Bureau of Land Management
BOR	U.S. Department of the Interior, Bureau of Reclamation
BRBNA	The Blue Ridge-Berryessa Natural Area—an area defined roughly by the Putah Creek watershed and the Cache Creek watershed below Clear Lake.
CRHR	California Register of Historic Resources
CRWA	Cedar Roughs Wildlife Area
Department	The California Department of Fish and Game
ICE	Information Center for the Environment
MCV	The Manual of California Vegetation
NRS	University of California Natural Reserve System
Special status species	Species that are State or federally listed as Threatened, Endangered, those considered as candidates or proposed for listing, State Species of Special Concern, and plants considered by the California Native Plant Society as rare, threatened, or endangered.
UCD	University of California, Davis

I. INTRODUCTION

The Cedar Roughs Wildlife Area (CRWA), located in the inner north coast range of California at the northeast end of Napa County, comprises over 400 acres of serpentine chaparral and serpentine grassland and riparian woodland. The CRWA abuts the 5600-acre Cedar Roughs Wilderness Study Area (WSA), which is administered by the Bureau of Land Management (BLM), and provides the only legal public access to this extensive wilderness area. The Cedar Roughs WSA is remarkable for its lack of impact by human activity and for its exceptional stands of Sargent cypress. Although Sargent cypress is found on serpentine throughout northern California, the stand at Cedar Roughs is unique because of its size (over 3000 acres, of which 2800 are within the WSA) and because it shows little evidence of hybridization with McNab cypress (cite BLM 1988 ACEC/RMA management plan). Such hybridization typically occurs in cypress communities. Because of the pristine condition of this area, a 1979 Wilderness Study Area inventory determined that it met the minimum standards for naturalness and for solitude and primitive unconfined recreational opportunities. In 1984, BLM further designated the Cedar Roughs WSA as an Area of Critical Environmental Concern – Research Natural Area to be managed to preserve its primitive nature, to provide for non-motorized public access, and to promote academic research of natural or cultural resources. At this time, the Cedar Roughs WSA was inaccessible by the public because privately owned lands surrounded it. In 1995, the Department of Fish and Game (Department) in cooperation with the BLM purchased the parcels that now comprise the Cedar Roughs Wildlife Area for the purpose of opening up the greater Cedar Roughs Wilderness Study Area to public access and hunting.

While the primary purpose for acquiring the Cedar Roughs Wildlife Area was to provide access to Wilderness Study Area, the CRWA also has conservation value in its own right. It contains serpentine seeps and stands of serpentine grassland and serpentine chaparral that are relatively undisturbed by human activity and free of non-native plant species. Serpentine plant communities are ecologically significant because they contain numerous endemic species that have evolved to tolerate the harsh conditions of serpentine soils and because they are relatively resistant to invasion by non-native species. Serpentine grasslands in particular, act as refugia for many native grass species that are greatly reduced elsewhere in California. Grasslands are among the most threatened plant communities in California. More than 99% of California native grasslands have been lost or become dominated by non-native species, and areas with serpentine-derived soils contain some of our few remaining examples of pre-European California grasslands.

In addition to its important serpentine plant communities, the CRWA contains about 1.5 miles of streamside vegetation. Statewide over 95% of historic streamside shrubs and trees have been lost to urbanization, agriculture, flood control, grazing, and invasion by non-native species (USFWS 2001). The riparian corridors at the CRWA are heavily

invaded by tamarisk and other non-native species, but the potential exists to restore these plant communities to a condition in which they are dominated by native species.

This Management Plan is a product of the Department's commitment to manage the resources of the CRWA in accordance with state and federal laws, incorporating the best available scientific information and professional judgment. This Plan also incorporates the Department's commitment to coordinate and cooperate with CRWA neighbors, members of the Blue Ridge-Berryessa Natural Area (BRBNA) Conservation Partnership, and other individuals and agencies managing lands within the BRBNA. This plan proposes science-based conservation of the natural ecosystem and provides for compatible public use, both subject to various mandates that guide the Department including the stated mission of the Department and the purpose of Wildlife Areas. Constraints to implement the plan's goals and tasks include budgetary limitations and personnel shortages.

❖ Mission of the Department

The Department of Fish and Game, as part of the Resources Agency of the State of California, has the following mission to guide its planning and operations:

> *The Mission of the Department of Fish and Game is to manage California's diverse fish, wildlife, and plant resources, and the habitats upon which they depend, for their ecological values and for their use and enjoyment by the public.*

The Department of Fish and Game maintains native fish, wildlife, plant species and natural communities for their intrinsic and ecological value and their benefits to the public. This includes habitat protection and maintenance in a sufficient amount and quality to ensure the survival of all species and natural communities. The Department is also responsible for the diversified use of fish and wildlife including recreational, commercial, scientific and educational uses.

❖ Purpose of Wildlife Areas

The Department of Fish and Game currently manages over 100 state wildlife areas. These areas are scattered throughout the state, most located in central and northern California. The state owns about two-thirds of the total acreage while the remainder is managed under agreements with other public agencies.

The state acquires these wildlife areas to protect and enhance habitat for wildlife species, and to provide the public with wildlife-related recreational uses. These lands provide habitat for a wide array of plant and animal species, including many listed as threatened or endangered.

❖ The Management Plan

The Department develops management plans for all Department-administered lands. The Department's purpose in preparing these plans is multifold:

- to guide management of habitats, species, and programs to achieve the Department's mission to protect and enhance wildlife.
- to identify appropriate public uses of the property.
- to serve as a descriptive inventory of fish, wildlife and native plant habitats that occur on or use the property.
- to provide an overview of the property's operation and maintenance, and personnel requirements to implement management goals. It also serves as a budget planning aid for annual regional budget preparation.
- to provide a description of potential and actual environmental impacts and subsequent mitigation that may occur during management, and to provide environmental documentation to comply with state and federal statutes and regulations.

In addition, this plan has the following purpose, which are specific to the CRWA:

- to direct an ecosystem approach to the management of the CRWA in coordination with the Blue Ridge-Berryessa Natural Area Conservation Partnership and in a manner that promotes cooperative relationships with owners and managers of adjoining private and public lands.

❖ The Planning Process

Preparation of this plan was a joint effort involving staff from the Department, the University of California Davis Natural Reserve System (NRS), and the University of California Davis Information Center for the Environment (ICE). The Department provided overall guidance to the planning process and was responsible for all decisions about the content of the plan. The University, under contract to the Department, provided technical and scientific expertise, Geographic Information System support, and was responsible for most administrative aspects of the Plan including preparation of initial drafts. The UC Davis NRS and ICE have expertise specific to the CRWA. The UC Davis NRS administers the McLaughlin Reserve, which is near the CRWA, and Reserve staff members as well as several University faculty have expertise in local resource management issues. Also, independent of this Plan, UC Davis ICE has been coordinating a new vegetation mapping effort for Napa County. This vegetation map lays the framework for resource management within the CRWA.

A core group of Department and UC staff worked closely together during plan development. This group solicited input from additional Department staff and University staff and faculty as needed, and reported directly to the Supervising Biologist for the Department's Central Coast Region. Information to guide the Plan's content came from four primary sources:

1. Department policy and federal and state law.
2. Public input solicited during a public outreach program.
3. Consultation with BRBNA Conservation Partners and other area land managers as part of an integrated planning program.
4. Gathering of information about the occurrence of biological and cultural resources (including limited field surveys), and analysis of scientific literature to assess the efficacy of different management strategies.

Policy direction—Management goals for the CRWA are guided by the mission of the Department, Department regulations for Wildlife Areas, and by state and federal laws, including the Endangered Species Act, the California Environmental Quality Act, and the American's with Disabilities Act. These policies and laws provided a framework with which to guide the overall direction of the Plan, to evaluate public input (e.g., to determine the compatibility of proposed public uses), and to prioritize resource surveys and management goals (e.g., to identify and protect sensitive species or historical resources).

Public outreach—The Department's goal in formulating this Plan was to ensure that the public was given adequate opportunity to express their desires regarding management and public use of the CRWA, and to consider these desires in conjunction with the other three sources of information that guided the Plan's content. The centerpiece of this effort was a pair of public outreach meetings to obtain direct input from both organized groups and individuals interested in the Wildlife Area. These meetings occurred on August 6, 2003, at the Napa Public Library, and October 20, 2003, at the Woodland Public Library, both from 6:45 to 8:30 PM. Attendance at these meetings was 47 and 20, respectively. Announcements for each meeting were posted on the Department's web site and sent to newspapers in Lake, Napa, Yolo, and Solano Counties. In addition, announcements were sent specifically to local hunting, hiking, bicycling, and equestrian groups to ensure that all potential Wildlife Area users were represented. Each meeting was moderated by University staff members and began with a brief presentation by Department and University staff outlining the planning process, the mission of the Department, and the natural and physical features of the Wildlife Area. Both meetings solicited input for two Wildlife Areas, the CRWA and the nearby Knoxville Wildlife Area.

Following the introduction, the meeting moderators accepted oral comments from meeting attendees about the issues they would like addressed in the management plan. The moderators did not respond to or discuss comments during the meeting, other than to try and clarify points that were made by participants. The intent of the meeting was to gather ideas and information, rather than to debate which management strategies were

appropriate for the Wildlife Area. As comments were made, they were transcribed onto poster paper. At the end of the meeting, each participant was given 5 adhesive dots, which could be placed by any of the comments. Participants were asked to place the dots on comments with which they strongly agreed or felt were most important. This procedure permitted all comments to be ranked in terms of their relative importance to attendees.

In addition to taking oral comments, meeting participants were given forms with which they could submit written comments. Written comments were accepted by e-mail or mail through December 2003. All input received during meetings or in writing is summarized in Appendix A.

Integrated planning—The Cedar Roughs Wildlife Area is part of a mosaic of public and private properties that comprise the Blue Ridge-Berryessa Natural Area (BRBNA), which encompasses the watersheds of Putah and Cache Creeks. Other substantial conservation ownerships within the BRBNA include those of the Bureau of Land Management (BLM), the University of California, Natural Reserve System (UCNRS), the Bureau of Reclamation (BOR), and the Gamble Ranch. In preparing the Management Plan for CRWA, direct coordination with these agencies and landowners maximizes the benefit of the Wildlife Area for ecosystem functioning, and for fish, wildlife and plant habitat. Coordination also promotes cost effective management for all conservation owners and quality recreational opportunities for the public while safeguarding private property rights. Coordination was important during the preparation of this Management Plan and will continue to play a role in the ongoing management of the Wildlife Area. The Integrated Planning Program facilitated coordination using two approaches: (1) direct contacts with agencies and landowners, and (2) use of the BRBNA Conservation Partnership as a clearinghouse for information regarding this Management Plan and as a forum for input from interested parties. The BRBNA Conservation Partnership is a voluntary and inclusive organization of public, private, and non-profit partners who have a shared goal of promoting the conservation and enhancement of the lands that comprise the BRBNA by encouraging the sensitive management of its natural, agricultural, recreational, archeological, and historical resources.

This Integrated Planning Program was intended to guide the preparation of this Management Plan so that the ultimate product:

- Is compatible with and complementary to the plans of other conservation property managers in the BRBNA.
- Directs the coordinated management of the Wildlife Area with other public and private conservation property managers.
- Directs appropriate management coordination with adjoining private property owners.

The Integrated Planning Program incorporated two components:

- Initial meetings between Department and University staff and appropriate staff of BLM and BOR to identify specific opportunities for coordinated planning and management.

- Ongoing project updates to the BRBNA Conservation Partnership, with a request for specific input as to integration of planning efforts and coordination of ongoing management.

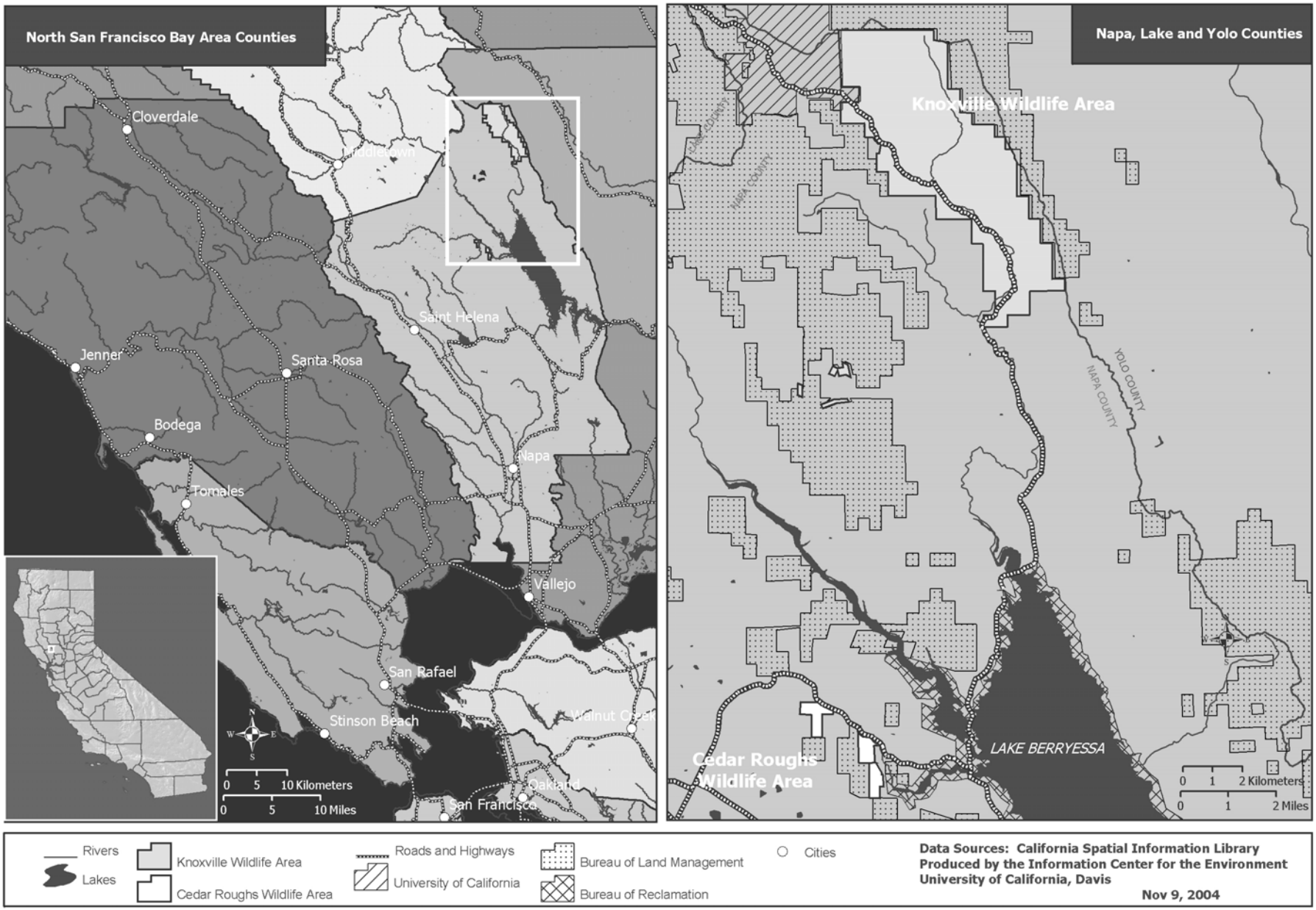
Science and analysis—Scientific data to guide this Plan came from a variety of sources including existing natural and cultural resource inventories, additional surveys for rare plants, non-native invasive plants, and historically significant sites, and a review of the scientific literature covering relevant management issues (e.g., the effect of grazing on grassland species composition and the effect of bicycling on native plant cover and soil movement).

The most valuable natural resource inventory in existence prior to the start of the planning process was a new digital vegetation map of Napa County based on the Manual of California Vegetation Classification (Sawyer and Keeler-Wolf 1995, Thorne et al. in press). This map was used to identify likely areas where sensitive species or invasive species might occur and was used to guide all additional survey efforts in the Wildlife Area. Besides the vegetation map, existing information about the occurrence of plant and animal species of the CRWA was sparse. Information was limited to a few records in the Department's California Natural Diversity Database and a personal plant list maintained by a member of the Napa Chapter of the California Native Plant Society.

No formal archaeological surveys had been conducted prior to the start of the planning process, although the Department had compiled an inventory of potentially significant sites based on observations of Department personnel. As part of the planning process, the Anthropological Studies Center of Sonoma State University was contracted to conduct limited cultural resource surveys at the CRWA. These surveys focused on areas along historic roads, which is where most public use is concentrated.

University of California staff members and subcontractors conducted targeted biological surveys to fill key gaps in previously existing inventory data. These surveys focused on the following areas: the distribution of sensitive plants, the distribution of non-native invasive plant species, and the distribution of remaining grasslands dominated by native species. Methods and results for these surveys are presented in Appendix B.

Figure 1: Location of the Cedar Roughs Wildlife Area



II. DESCRIPTION OF THE WILDLIFE AREA

❖ Geographic Setting

The Cedar Roughs Wildlife Area consists of two units, totaling 413 acres, which are located west of Lake Berryessa and south of Pope Canyon Rd. in northern Napa County. One unit, named the "Lake Berryessa Unit" for purposes of this plan, adjoins Bureau of Reclamation land at Lake Berryessa to the east, the Bureau of Land Management (BLM) Cedar Roughs Wilderness Study Area (WSA) to the south, and an additional 480 acres of BLM land to the west. The second unit, named the "Maxwell Creek Unit" for purposes of this plan, adjoins an isolated 160-acre BLM parcel to the south. Both units contain segments of Pope Creek.

❖ Acquisition of the Wildlife Area

The primary purpose for acquiring the Lake Berryessa Unit of the Cedar Roughs Wildlife Area was to provide public access from Pope Canyon Road to BLM's 5600-acre Cedar Roughs WSA. The Maxwell Creek Unit provided public access to an additional 160 acres of BLM land that was previously surrounded by private land. Additional reasons for the purchase were to restore riparian habitat along Maxwell and Pope Creeks, and to restore grassland and oak woodlands on the properties, which were impacted by over 90 years grazing and farming (cite Minutes of WCB meeting, Nov 9, 1995).

Prior to the Department's acquisition of the Cedar Roughs Wildlife Area, legal public access to the BLM Cedar Roughs WSA was unavailable because it was entirely surrounded by private land. Use of the WSA was limited to surrounding property owners. Providing public access to the Cedar Roughs WSA, either through land exchanges, land purchases, or easements has been a management priority for the BLM since its 1988 Management Plan for the area. The Department was particularly interested in working with the BLM to secure public access to the Cedar Roughs WSA because only a small acquisition was needed to open up approximately 5,800 acres for public use.

In 1995, the Department negotiated with three landowners to purchase the two units of Cedar Roughs Wildlife Area (two parcels in the Lake Berryessa Unit and one parcel in the Maxwell Creek Unit), and the Wildlife Conservation Board authorized the disbursement of $667,480 ($645,746 appraised value plus $21,734 transaction costs) from the California Wildlife, Coastal and Park Land Conservation Fund. Acquisitions of the three parcels were finalized between December 1995 and January 1996.

❖ Easements

The Maxwell Creek Unit (173.17 acres, APN 19-020-022) was purchased from the Bryant Moynihan, et al partnership in January 1996. The Moynihans retained an easement along Dollarhide Road for its maintenance and for ingress and egress. Dollarhide Road was officially abandoned by the County of Napa in 1991, and is currently is inaccessible to two-wheel drive, partly because of the heavily vegetated river crossing at Pope Creek. The County retained its right to reopen the Dollarhide Road right of way in the future. The road also has an easement for public access and utilities to the BLM parcel directly to the south of it. There is also an easement for roadway and utilities along Pope Canyon Road.

The Lake Berryessa Unit was purchased from two separate parties; Carl and Barbara Sciambra (122.31 acres, APN 19-020-008) and the Schleup family Trust (118.11 acres, APN 19-020-009). Previous owners of these parcels granted an easement across them for access to a neighboring property. The easement is 50 feet in width for ingress, egress and utilities. No grantee has come forward to exercise this easement to date.

❖ Property Boundaries, Land Use, History, and Cultural Resources

Property Boundaries and Current Land Use— The Cedar Roughs Wildlife Area is bounded by private land and by public land administered by the Bureau of Land Management and the Bureau of Reclamation. The Lake Berryessa Unit is bordered on the north by Pope Canyon Road, on the east by private land and BOR land, and on the south and the west by BLM land. The Maxwell Creek unit is bordered on the south by an isolated 160-acre parcel of BLM land and on the north by private land and Pope Canyon Road. It is bordered on the west and the east by private land. Historical uses of both units were probably limited to cattle grazing. Both units have little grassland, and most cattle grazing probably occurred along Maxwell Creek. Currently there is little evidence of cattle grazing on the private lands adjacent to the CRWA.

Historical Land Use— The human history and pre-history of the CRWA and the surrounding lands is typical of the inner coast range and other areas inland of the influence of Spanish missions. Native Americans occupied the area until the mid-1800s when Europeans arrived to homestead and to prospect silver and mercury. Historical records from the time of European arrival indicate that the CRWA was within the territory of the Hill Patwin, near their boundary with the Lake Miwok to the west. The Hill Patwin were related culturally and linguistically to other Wintun speakers in the Sacramento Valley, whereas the Lake Miwok were related to the Miwok of western Sonoma and Marin Counties. The Hill Patwin occupied winter villages in open valleys along Putah and Cache Creeks. The specific Hill Patwin tribelet living closest to the CRWA was the Topaidisel. Their principal settlement, Topai, is now beneath Lake Berryessa.

The area surrounding the CRWA began to be settled in 1843, when Governor Micheltorena granted eight square leagues, Ranch Las Putas, to two brothers Jose de Jesus and Sisto Berryessa (Haydu 2004b).

Cultural Resources— In 2003, the Anthropological Studies Center of Sonoma State University conducted a limited cultural resources survey at the CRWA (Haydu 2004b). This survey included the segment of Dollarhide Road that runs through the Maxwell Creek Unit, and a potential two-acre parking area along Pope Canyon Road in the Lake Berryessa Unit. The survey did not reveal any significant cultural resources.

Outside of the targeted survey area a few historical sites and artifacts have been noted by University and Department staff members. These include the remains a barn or cabin and a likely homestead or campsite, both in the Lake Berryessa Unit.

❖ Geology, Soils, Climate, Hydrology

Geology— Geology explains much of the diversity of soil, vegetation, and wildlife habitat that occurs within the Cedar Roughs Wildlife Area. The geologic history of the CRWA can be traced back to the late Jurassic and Cretaceous periods (140 to 100 million years ago) when the oceanic Farallon plate was being subducted under the western margin of the North American continent. This event was responsible for much of the formation of California's Coast Range as well as the Sierra Nevada. The Farallon plate consisted of oceanic crust extruded from mid-oceanic spreading centers. As molten rock crystallized from these spreading centers they formed an ordered series of rocks that included peridotite at the base, gabbro, and basalt at the top. This series is collectively known as the Coast Range Ophiolite. Peridotite is rich in iron and magnesium (ultramafic), and under exposure to seawater magnesian silicates become hydrated to form serpentine. Much of the peridotite in the Coast Range Ophiolite was subsequently metamorphosed into serpentine.

As the Farallon plate descended beneath the North American Plate, material on the down going plate, mostly marine sediments, was scraped off against the edge of the continental plate. This shearing action formed a highly complex and disordered formation of rocks called the Franciscan Complex.

The CRWA contains a mixture of substrates derived from the Franciscan Complex and the serpentine-rich Coast Range Ophiolite. The Cedar Roughs Wilderness Study Area is in effect an "island" of serpentine and serpentinized peridotite surrounded by Franciscan Complex. Relative to most rocks from the continental crust, serpentine is rich in magnesium and iron, and sometimes nickel, cobalt, and chromium. It is poor in calcium, silica, potassium, and sodium. As a consequence many plants are unable to grow on serpentine. Those that do often have reduced stature, and serpentine plant communities are typically sparse. Serpentine substrates also support a large number of endemic species that have evolved mechanisms to tolerate the harsh growing

conditions, but frequently are unable to compete with other species when growing off of serpentine. Within the CRWA, plant communities growing on serpentine have distinctly different composition and structure from communities growing on sedimentary substrates.

Soils— Soils in Napa County were mapped by the USDA Soil Conservation Service (now the Natural Resources Conservation Service) in 1965 through 1973 and published in August 1978. Soil names and descriptions that follow are taken from this map (Appendix C).

Both units of the CRWA are predominantly of a single soil type—a Henneke gravelly loam with 30-75% slope. Soils in the Henneke series are derived from serpentine and are shallow with loamy to clayey textures, little horizon development, and high gravel and rock fragment content. Henneke soils usually support chaparral.

In a representative profile of a Henneke soil the surface layer is reddish brown, neutral gravelly loam 7 inches thick. The subsoil is reddish brown, mildly alkaline very gravelly clay loam 8 inches thick. Fractured, greenish blue serpentine is at a depth of 15 inches.

The floodplain in the immediate vicinity of Maxwell Creek is classified as a Maxwell Clay with 2-9% slope. This soil is derived from serpentine alluvium transported by Maxwell Creek, and supports a grassland plant community.

In a representative profile of a Maxwell Clay the surface layer is dark gray, mildly and moderately alkaline clay 38 inches thick. The underlying material, to a depth of 62 inches or more, is gray, moderately alkaline clay that is calcareous at a depth of more than 48 inches.

Two other soil types occur in a very small portion of the CRWA near the confluence of Maxwell and Pope Creeks. These are the Montara Clay Loam (5-30% slope) and the Bressa-Dibble Complex (30-50% slope). Like the more common soil types at the CRWA, the Montara Clay Loam is also derived from serpentine parent material. In a representative profile of Montara Clay Loam, the surface layer is grayish brown and dark grayish brown mildly alkaline clay loam underlain at a depth of 12 inches by serpentine. The Bressa-Dibble complex is the only non-serpentine soil mapped at the CRWA. It derives from material weathered from sandstone and shale.

Hydrology and Climate— All of the Cedar Roughs Wildlife Area lies within the watershed for Pope Creek, which in turn is within the greater Putah Creek watershed. The main drainage within both units of the CRWA is Pope Creek, which is paralleled for its entire length through the CRWA by Pope Canyon Road. Maxwell Creek is a major tributary of Pope Creek and runs through the center of the Maxwell Creek Unit. Like other watersheds in the region with extensive serpentine, Pope and Maxwell Creeks may maintain a low level of flow year round because of input from nearby springs in

serpentine substrates. Outcrops of serpentine characteristically contain springs and seeps, many of which have year round flow.

The water quality of Maxwell and Pope Creeks has not been examined but is probably similar to other serpentine drainages in which the chemistry of the surface water reflects the surrounding geology: high content of sodium and magnesium salts derives from serpentine in the watershed

The CRWA has a typical Mediterranean climate, with hot, dry summers, and most precipitation occurring as rain in the winter. The Soil Survey of Napa County estimates annual precipitation in the vicinity of the CRWA at about 30 inches.

Figure 2: Cedar Roughs Wildife Area depicted on U.S. Geological Survey digital orthophoto quarter quads taken in 1993

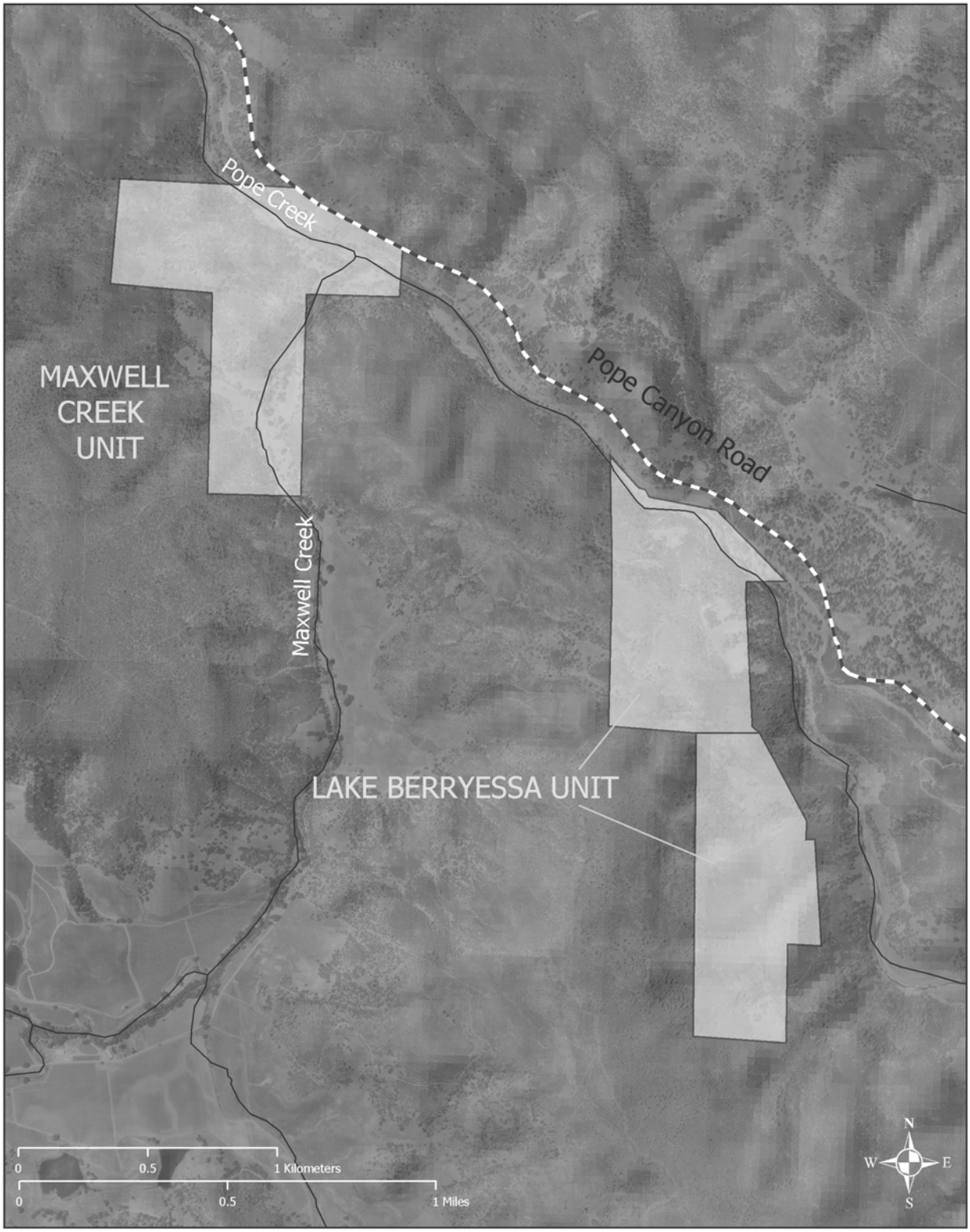
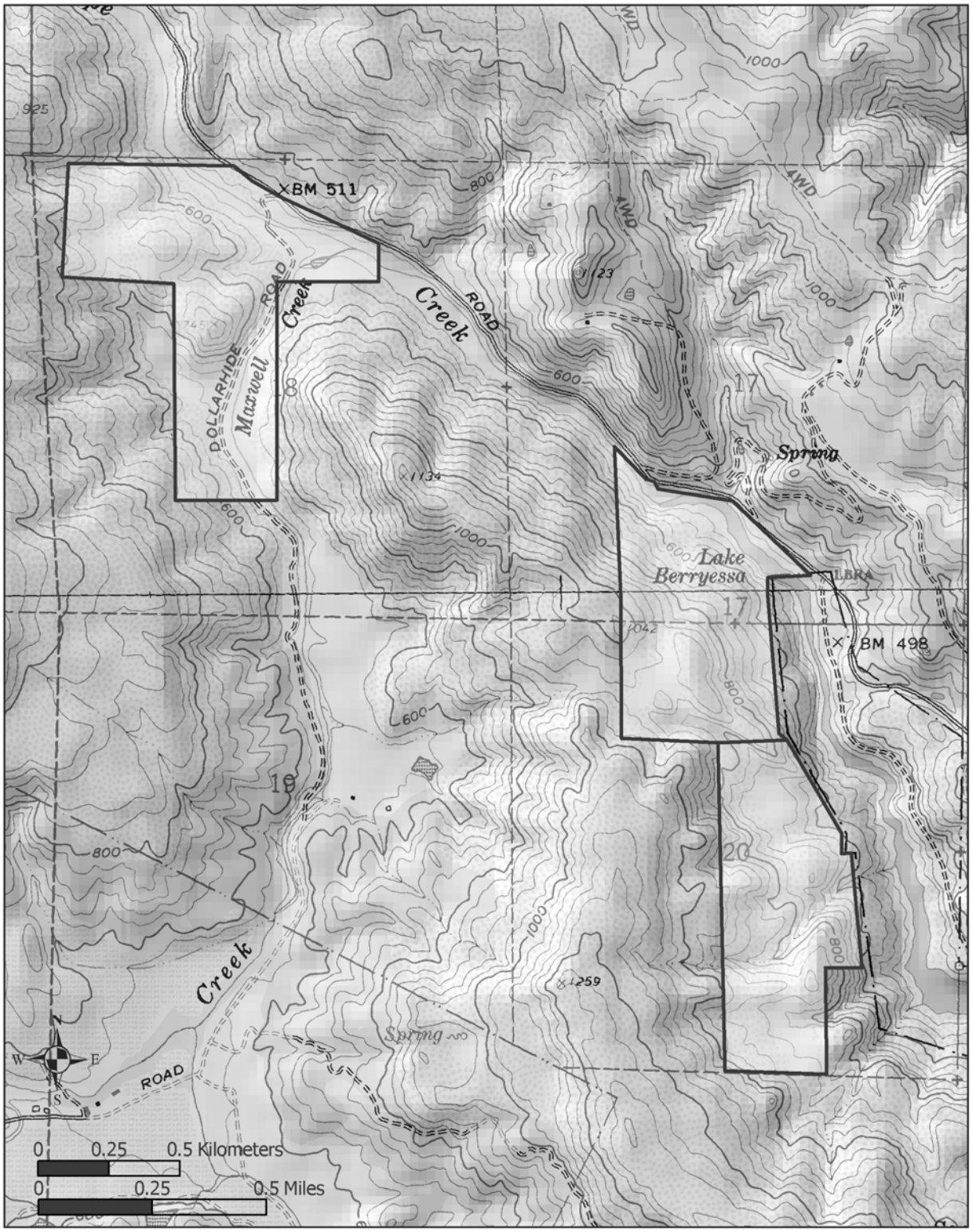


Figure 3: Cedar Roughs Wildlife Area depicted on U.S. Geological Survey 1:24K quad maps (Chiles Valley and Walter Springs Quads)



Data Sources: California Spatial Information Library
Produced by the Information Center for the Environment
University of California, Davis
December 27, 2004

III. VEGETATION, HABITAT, AND SPECIES DESCRIPTIONS

❖ Vegetation

Vegetation at the Cedar Roughs Wildlife Area is determined largely by geology. Areas with soils derived from serpentine and other ultramafic rock have plant species and vegetation types distinct from areas with soils derived from sedimentary rock. Serpentine substrates are home to many plant species that are serpentine endemics—that is they occur only on serpentine. Because of the limited distribution of serpentine, many of these endemics are rare or are species of special concern.

A vegetation map based on A Manual of California Vegetation (Sawyer and Keeler-Wolf 1995) was recently published for Napa County (Thorne et al. in press), and this map is used as the basis for describing vegetation at the Cedar Roughs Wildlife Area (Figure 4). The Manual of California Vegetation (MCV) is published by the California Native Plant Society and is the result of an effort to develop a consensus classification for floristic (as opposed to physiognomic) descriptions of California vegetation. Current Department guidelines for producing management plans specify that vegetation descriptions should follow the MCV. The current MCV map for Napa County is based on U.S. Geological Survey digital orthophoto quarter quads (DOQQs) taken in 1993. These DOQQs have high resolution (one-meter pixels), which permitted minimum mapping units of one hectare or less.

The MCV classification system is hierarchical, with the highest levels (Class and Group) based on vegetation physiognomy (plant growth form, leaf type, seasonality) and lower levels (Super-alliance, Alliance, and Association) based on the floristic composition of the vegetation. Most polygons within the Napa County MCV map describe an alliance, a super-alliance, or an association. The alliance (formerly referred to as a "series") is the principal unit of vegetation classification in the MCV. Alliance definitions are based on dominant or diagnostic species in the dominant vegetation stratum (e.g., the tree canopy for woodland, the shrub layer in shrubland, and the ground layer in grassland. In the DOQQ imagery used to create the Napa County MCV map different alliances were sometimes indistinguishable leading to the formation of a super-alliance (e.g., two similar oak alliances, leading to a mixed oak super alliance). These super alliances are not formally defined (NFD) in the Manual of California Vegetation. Variation within alliances can be further described using associations (e.g., the mixed oak alliance can be subdivided into associations depending on which oak species are present). Many of the associations included on the Napa County MCV map are not formally defined in the MCV. They were included on the assumption that they will eventually be defined and incorporated in the MCV.

The Napa County MCV map identifies 13 cover types within the Cedar Roughs Wildlife Area (Table 1), of which 12 are defined by floristics, and one (riverine mudflat) is not. Vegetation at the CRWA is dominated by several vegetation alliances and super alliances (map codes 4303, 4304, 4305, 4306, and 4321) that can broadly be labeled as serpentine chaparral. Other alliances or super alliances that occur within the CRWA include the serpentine grassland super alliance, the blue oak alliance, the valley oak alliance, the white alder alliance, and the mixed willow super alliance. Small patches of serpentine grassland super alliance and blue oak alliance occur within the chaparral. The riparian corridor along Maxwell Creek is dominated by the valley oak alliance, and the riparian corridor along Pope Creek contains a mixture of the mixed willow super alliance, the valley oak alliance, and the white alder alliance.

Table 1. Cover types described in the Napa County MCV vegetation map that occur within the Cedar Roughs Wildlife Area.

Group	Map Code	Alliance/Super Alliance	Association
Cold season deciduous forests & woodlands	3122	Blue oak alliance	
	3123	Valley oak alliance	
	3101	Valley oak alliance	Valley oak – (California bay – coast live oak – walnut – ash) riparian NFD association
Temporarily flooded cold season deciduous forests & woodlands	3201	White alder alliance	White alder (mixed willow – California bay –big leaf maple) riparian forest NFD association
	3221	Mixed willow super alliance	
Sclerophyllous evergreen shrubland (chaparral)	4303	Leather oak – white leaf manzanita – chamise xeric serpentine NFD super alliance	
	4304	Leather oak – California bay – *Rhamnus* spp. mesic serpentine chaparral NFD alliance	
	4305	White leaf manzanita – leather oak – (chamise – *Ceanothus* spp. (foothill pine)) xeric serpentine NFD super alliance	
	4306	California bay – leather oak – (*Rhamnus* spp. (foothill pine)) mesic serpentine NFD super alliance	
	4321	Chamise alliance	
Annual herbaceous	7120	California annual grassland alliance	
	7130	Serpentine grassland NFD super alliance	
Sparsely vegetated	9002	Riverine mudflat	

Blue oak alliance—The blue oak alliance is defined by having blue oak as the sole or dominant tree in the canopy. It is a relatively uncommon cover type at the CRWA occurring primarily as a single stand in the Lake Berryessa Unit. A second, very small stand occurs along Pope Canyon Road in the Lake Berryessa Unit. The blue oak alliance is an indicator that the underlying substrate is not derived from serpentine.

Valley oak alliance—The valley oak alliance is mapped at both the alliance and the association level. At the alliance level (Code 3123), this cover type is defined by having valley oak as the dominant canopy species, and it almost always occurs on level to moderately sloped ground. At the CRWA, this cover type occurs only in a small stand at the confluence of Maxwell Creek and Pope Creek. The valley oak – (California bay – coast live oak – walnut – ash) riparian association is a provisional association within the valley oak alliance that is more widespread at the CRWA. This association is the primary vegetation type along Maxwell Creek and is the dominant type along Pope Creek.

White alder (mixed willow – California bay – big leaf maple) riparian forest association—This association typically occurs in small islands in narrow canyons with perennial streams, often in association with California bay or willow. The vegetation type may also include a small component of valley oak. At the CRWA this cover type occurs in a small stand along Pope Creek in the Lake Berryessa Unit.

Mixed willow super alliance—The Manual of California Vegetation contains a mixed willow alliance, but in the Napa County MCV vegetation map it is considered a super alliance because in the DOQQ imagery single-species willow stands cannot be distinguished from mixed-species stands. This super alliance is defined by having one or more willow species (*Salix* spp.) important as a shrub or tree in the canopy. This cover type occurs in the CRWA along Pope Creek, where it is heavily invaded by non-native tamarisk.

Chamise alliance—This alliance is a type of chaparral defined by having chamise (*Adenostoma fasciculatum*) as the sole or dominant species in the shrub canopy. This type is widespread at the CRWA, where it occurs mostly on xeric slopes that may have some serpentine influence. This alliance occurs in dense stands, with 70-80% relative cover of chamise.

Leather oak – white leaf manzanita – chamise xeric serpentine super alliance—This form of chaparral is restricted to xeric serpentine soils. It is defined by having leather oak (*Quercus durata*), white leaf manzanita (*Arctostaphylos viscida*), and chamise as important components of the canopy, and may also include foothill pine at less than 5% cover. It occurs in both units of the CRWA.

Leather oak – California bay – *Rhamnus* spp. mesic serpentine chaparral alliance—This form of chaparral occurs in more mesic settings in serpentine soils, typically on concave north-facing slopes. It is defined by having leather oak, California bay, and *Rhamnus tomentella* as important components of the canopy. At the CRWA it occurs in a single stand in the Maxwell Creek Unit.

White leaf manzanita – leather oak – (chamise – *Ceanothus* spp. (foothill pine)) xeric serpentine super alliance—This chaparral is common on xeric serpentine sites. It contains leather oak as an important component of the canopy usually with chamise

and *Ceanothus jepsonii*. Foothill pine also occurs, usually at less than 5% cover. This cover type occurs in both units of the CRWA.

California bay – leather oak – (*Rhamnus* spp. (foothill pine)) mesic serpentine super alliance—This chaparral typically forms transitions with the white leaf manzanita – leather oak – (chamise – *Ceanothus* spp. (foothill pine)) xeric serpentine super alliance, but occurs in more mesic, north-facing conditions. It contains California bay and leather oak as important components of the canopy, also with *Rhamnus tomentella*, and less than 5% cover of foothill pine. At the CRWA this cover type occurs on north facing slopes above Pope Creek.

California annual grassland alliance—Much of the grassland at CRWA occurs on serpentine substrates. A single small patch of non-serpentine California annual grassland occurs along Pope Canyon Road in the Maxwell Creek Unit. This herbaceous cover type occurs on non-serpentine substrates where shrubs and trees make up less than 10% of the emergent cover. Non-native annual grasses and herbs are dominant in the ground layer. Annual grasslands in the vicinity of the CRWA are typically dominated by Mediterranean annual grasses such as oat grass (*Avena fatua* and *Avena barbata*), medusahead (*Taeniatherum caput-medusae*), soft chess (*Bromus hordeaceus*), rip-gut brome (*Bromus diandrus*), wild rye (*Lolium multiflorum*), and rattail fescue (*Vulpia myuros*). Non-native forbs, such as yellow starthistle (*Centaurea solstitialis*), black mustard (*Brassica nigra*), filaree (*Erodium cicutarium* and *E. botrys*), bur clover (*Medicago polymorpha*), and Italian thistle (*Carduus pycnocephalus*) may also occur.

Serpentine grassland super alliance—This cover type is mapped where grasslands (less than 10% shrub and tree cover) co-occur with serpentine soils. Serpentine grasslands may support a plant community with a high composition a native grasses and forbs. The proportion of native species in serpentine grasslands in the vicinity of the CRWA is about 80% compared to 40% in non-serpentine grasslands (Harrison 1999?). Native grasses common in serpentine grasslands include purple needlegrass (*Nassella pulchra*), squirreltail (*Elymus elymoides*), bluegrass (*Poa secunda*), and onion grass (*Melica* spp.). Common forbs include clarkia (*Clarkia purpurea* and *C. gracilis*), birds-eye gilia (*Gilia tricolor*), goldfields (*Lasthenia californica*), and mariposa lily (*Calochortus luteus*, *C. superbus*, and *C. vestae*). Serpentine grasslands occur in small patches in both units of the CRWA.

❖ Vascular Flora and Plant Species of Special Concern

Plant surveys conducted as part of this Plan focused on threatened or endangered species, rare species, or species of special concern. Surveys were conducted by Jake Rugyt on the following dates: April 15, 21, 2002; March 8, 21, 31, 2003; April 14, 22, 2003, May 24, 2003; June 21, 2003; April 10, 2004; June 19, 2004. Mr. Rugyt compiled a list of all plant species encountered on these surveys as well as on past visits to the

CRWA. This list is presented in Appendix D. It should not be considered comprehensive.

No state or federally listed species were found at the CRWA, but one species (*Hesperolinon serpentinum* (serpentine dwarf flax)) was found that is classified by the California Native Plant Society as rare, threatened, or endangered (CNPS List 1B) and 7 species were found that are classified by as having limited distribution (CNPS List 4) (California Native Plant Society 1994). An additional species (*Myosurus apetalus* (sedge mouse-tail) was found that has no formal status, but is rare in Napa County. List 1B species are considered rare, threatened, or endangered in California and elsewhere. All of the plants on the 1B list meet the definitions of Sec. 1901, Chapter 10 (Native Plant Protection Act) or Secs. 2062 and 2067 (California Endangered Species Act) of the California Department of Fish and Game Code and are eligible for state listing. It is mandatory that these species be considered in the CEQA process. List 4 includes plants with limited distribution whose vulnerability to extinction appears low at this time. These species probably do not meet the eligibility requirements for state listing, but the CNPS recommends that List 4 plants be considered in the CEQA process. All List 1B and List 4 plants found at CRWA are endemic to, or most common on, serpentine substrates. *Myosurus apetalus* (sedge mouse-tail) is a plant of vernal pools.

CNPS List 1B:

- ***Hesperolinon serpentinum* (serpentine dwarf flax)**—Annual. Serpentine grasslands and chaparral, on slopes or flats. Observed at Cedar Roughs Wildlife Area in both units. A population was found in the Maxwell Creek Unit in vegetation type 4303 (Leather oak – white leaf manzanita – chamise xeric serpentine NFD super alliance). 20 to 50 plants found. Probably more plants in surrounding area. A population was found in the Lake Berryessa Unit in vegetation type 4306 (California bay – leather oak – (*Rhamnus* spp. (foothill pine)) mesic serpentine NFD super alliance). Abundance undetermined. This species may occur at other locations within this Unit. It also occurs on volcanic substrates in other parts of Napa County.

CNPS List 4:

- ***Astragalus breweri* (Brewer's milkvetch)—**Annual. Serpentine grasslands, flats. Observed at the Maxwell Creek Unit in 7130 (Serpentine grasslands super alliance). Abundance undetermined, found in one polygon only. Surveys were extensive enough to determine that this species is unlikely to occur at other locations on the CRWA.

- ***Astragalus clevelandii* (Cleveland's milkvetch)—**Perennial. Serpentine streams and seeps. This species was observed at the Maxwell Creek Unit in vegetation type 3101 (Valley oak (California bay – coast live oak – walnut – ash) riparian NFD – association). Although this vegetation type does not typically occur on serpentine substrates, at this site serpentine influence is evident in the

understory; an embedded 5222 (Brewer willow alliance). Over 50 plants found. Also observed at the Lake Berryessa Unit in 4306 (California bay – leather oak – (*Rhamnus* spp.) mesic serpentine NFD – super alliance).

- ***Clarkia gracilis* ssp. *tracyi* (Tracy's clarkia)—**Annual. Serpentine chaparral, grassy meadows. Observed at the Maxwell Creek Unit on a slope at the edge of old jeep road. Occurs at the transition of vegetation type 4305 (White leaf manzanita – leather oak – (chamise – *Ceanothus* spp. (foothill pine)) xeric serpentine NFD super alliance) with vegetation type 3101 (Valley oak – (California bay – coast live oak – walnut – ash) riparian NFD association). Undetermined number of plants between 50-500.

- ***Delphinium uliginosum* (swamp larkspur)—**Perennial. Serpentine streams, seasonal washes. Observed at the Maxwell Creek Unit in vegetation type 3123 (Valley oak alliance) with serpentine influence evident along the channel. Observed at the Lake Berryessa Unit in vegetation type 4306 (California bay – leather oak – (*Rhamnus* spp. (foothill pine)) mesic serpentine NFD super alliance).

- ***Helianthus exilis* (serpentine sunflower)—**Annual. Serpentine seeps and streams. Observed at the Maxwell Creek Unit. It is mapped within vegetation type 3123 (Valley oak alliance). It occurs adjacent to vegetation type 4306 (California bay – leather oak – (*Rhamnus* spp. (foothill pine)) mesic serpentine NFD super alliance), and there is serpentine influence evident along the channel. 300-500 plants.

- ***Navarretia jepsonii* (Jepson's Navarretia)—**Annual. Grassy meadows or fields on serpentine. Observed at the Maxwell Creek Unit in vegetation type 7130 (Serpentine grasslands alliance). 100-200 plants.

- ***Zigadenus micranthus* var. *fontanus* (marsh zigadenus)—**Perennial geophyte. Serpentine streams and alluvial fans. Observed at the Maxwell Creek Unit in two locations within vegetation type 3123 (Valley oak alliance) with serpentine influence evident along the stream channel.

Other species of concern:

- ***Myosurus apetalus* (sedge mouse-tail)—**Annual. Vernal pool. Observed at a single location in the Lake Berryessa Unit, in an unmapped unit of vegetation type 7200 (seasonally flooded grasslands and forbs (vernal pools)) embedded in a mapped unit of vegetation type 7130 (Serpentine grasslands super alliance). This species has no special status but is rare in Napa County, known only from one additional site. This represents a significant extension of the known range for this species. The vernal pool covers approximately 55 by 35 ft.

❖ Invasive Plants

About 89% of the plant species recorded in the CRWA are native to California; the rest are non-native species that have been imported, either intentionally or unintentionally, from elsewhere since European settlement. Non-native species that have the immediate potential to spread into natural plant communities are considered invasive. The impacts of invasive species on native communities include species endangerment (Wilcove et al. 1998), reductions in biodiversity (Rosentreter 1994) and wildlife habitat (Bedunah 1992), alterations to ecosystem processes such as fire frequency (D'Antonio and Vitousek 1992), and nutrient cycling and hydrology (Vitousek 1990), increases in topsoil loss (Lacey et al. 1989), alterations to soil microclimate (Evans and Young 1984), and economic impacts such as reductions in land value and livestock forage capacity (Sheley and Petroff 1999, Naylor 2000). The most severe impacts of invasive species often occur where they alter the disturbance regime, such as by increasing fire frequency(D'Antonio 2000, Levine et al. 2003).

The goal of the Department is to enhance native plant biodiversity, to reduce the abundance of existing non-native invasive species, and to prevent the establishment of new invading species. Non-native species are not distributed proportionally among vegetation types. Chaparral communities, both on and off serpentine, tend to have a low abundance of invasive species. By contrast, annual grasslands and the herbaceous layer in woodland cover types are dominated by invasive species. Grasslands on serpentine substrates tend to have less cover of invasive species compared to non-serpentine grasslands.

❖ Priority Vegetation Types and Invasive Species for Management

Because non-native invasive species and sensitive native species are not distributed uniformly among vegetation types, and because not all invasive species will be possible to control or eradicate, this Plan establishes a list of vegetation types in which prevention of future invasions and reversal of existing invasions is a high priority. In addition, Table 2 provides a "hot list" of invasive species that should currently be considered for management on the CRWA.

Priority Vegetation Types— This weed management plan aims to protect the following plant communities from invasion and to restore them to a native-dominated state to the greatest degree possible:

1. *Serpentine grasslands and seeps:* Serpentine grasslands and seeps harbor many of the sensitive plant species at the CRWA. Compared to non-serpentine grasslands, serpentine grasslands have a high proportion of native species. Because of their harsh soil conditions, serpentine grasslands have remained relatively resistant to invasion. Recently however, non-native species such as medusahead and barbed goatgrass have begun to invade serpentine grasslands

threatening the integrity of these valuable examples of native California grasslands.

2. *Riparian plant communities (Valley oak – (California bay – coast live oak – walnut – ash) riparian NFD association, Mixed willow alliance*; *White alder (mixed willow – California bay –big leaf maple) riparian forest NFD association; Mixed willow super alliance):* Riparian plant communities, particularly along Pope Creek have been especially impacted by human disturbance and invasion. Riparian invaders such as tamarisk, arundo, perennial pepperweed, and pampas grass have great potential to replace native riparian species, such as willows and to severely alter ecosystem function (e.g., by changing stream flow dynamics, water temperature, and habitat structure).

Priority Invasive Plants—A "hot list" of actual or potential invasive species that should be considered for management was prepared by considering several factors. Invasive species (e.g., wild oats, filaree) that have been long integrated in the California flora and that are widespread and abundant were not included in the list because of the prohibitive cost that would be involved in targeting these species. In contrast, more recent invaders or species that still appear to be spreading were generally included on the list, especially those that show the potential to disrupt ecosystems or have low cost control techniques. Invasive species meeting the above criteria that occur within the greater BRBNA but have not yet established at the CRWA were also included on the hot list. Threats posed by “hot-list” weeds (Table 2) present on or threatening to invade the CRWA are summarized below.

- *Aegilops triuncialis* (barbed goatgrass): Barbed goatgrass is an annual grass native to Eurasia that was first recorded in California on the border of Eldorado and Sacramento counties in 1914 after cattle from Mexico were imported and pastured (Kennedy 1928). It currently occupies a widespread and expanding area of grassland and shrubland below roughly 700 m in elevation in northern California (Peters et al. 1996).

  As a result of its ability to thrive in serpentine habitats, goatgrass poses a substantial threat to the CRWA's sensitive plants. During weed surveys conducted by UC and Department personnel in winter 2003, a small patch of barbed goatgrass was discovered along a trail in the Lake Berryessa Unit. This is the only known population of goatgrass in the CRWA, suggesting that it was introduced only within the past few years. Barbed goatgrass has been steadily spreading in serpentine grasslands to the north of the CRWA (Snell Valley and Morgan Valley).

  Goatgrass favors rocky, gravelly, well-drained soils, including those derived from serpentine, and thrives in open grasslands and disturbed habitats such as roadsides and pastures (Cronemiller 1928). It tends to grow larger in areas underlain by rocky, well-drained soils than in mesic habitats (Kelly Lyons, personal communication). It first appears as scattered plants, and rapidly

multiplies into solid patches (Peters et al. 1996). Spread can be so rapid that within 20 years, it can expand from a single infestation to dominance of a ranch (Peters et al. 1996). Spread may occur when its barbed awns allow seeds to be dispersed in the coats of livestock and wildlife, in clothing, and in vehicle undercarriages (Talbot and Smith 1930). Currently, the range of goatgrass is believed to be expanding northward in California, with new infestations reported annually and existing infestations continuing to expand (Peters et al. 1996).

The life cycle of barbed goatgrass begins when it germinates following the first fall rains. It flowers between April and June, and sets seed by late June, though this pattern may vary depending on the precipitation and temperature of a given season (Peters et al. 1996). It matures later than most other annual grasses of the California floristic province. As a result, its reddish-purplish heads can be easily distinguished in the field during late spring (Peters et al. 1996). Goatgrass is characterized by rapid rates of root and shoot growth, deep penetrating roots and low palatability to livestock (Peters et al. 1996). It exhibits relatively low rates of seed production, producing only 5-9 seeds per plant (Cronemiller 1928). Most seeds germinate in the first year after seedset, but may remain dormant in the soil for up to 5 years (Peters et al. 1996).

- *Ailanthus altissima* (tree-of-heaven): *Ailanthus* is a fast growing tree that is both a prolific seed producer and persistent stump and root sprouter. A native of China, it was introduced to the west coast during the gold rush by Chinese miners, and to the east coast by a Philadelphia gardener in 1784. *Ailanthus* typically occurs in disturbed areas, and in the vicinity of CRWA particularly in riparian corridors. At the CRWA, *Ailanthus* occurs near an old cabin/barn site in the Lake Berryessa Unit and along Maxwell Creek in the Maxwell Creek Unit. Department personnel treated the Lake Berryessa population with herbicide in spring of 2004.

  Ailanthus flowers in late spring and seeds ripen from September to October of the same year. Seeds may persist on the tree through winter, but are wind dispersed. An individual tree can produce hundreds of thousands of seeds. *Ailanthus* threatens riparian corridors at the CRWA by potential forming monospecific stands that replace native species. It can be controlled by a combination of mechanical and chemical means, but killing the main stem without simultaneously killing the roots usually results in extensive root sprouting.

- *Arundo donax* (arundo, giant reed): Arundo is a tall, perennial, cane-like grass that is very fast growing (up to 5 cm per day) and reaches heights of 2 to 8 meters. It grows from creeping rootstocks that form compact masses. Possibly native to eastern Asia, it was introduced to warmer areas of the United States and the world as an ornamental and for production of reeds for musical instruments. Arundo grows in wet sites but is capable of extending beyond the normal zone of riparian vegetation. Arundo does not occur within the CRWA, but is found around Lake Berryessa and along Putah Creek.

Arundo has seriously invaded most southern California waterways, forming monospecific stand over tens of thousands of acres. In northern California it is widespread but has so far been less prone to replacing native vegetation over entire waterways. Arundo threatens healthy ecosystem function because it can form vast monospecific stands that replace all native riparian vegetation. These monospecific stands provide habitat for few if any native animals. Arundo also burns easily, but is not killed by fire, so it can increase the frequency of large wildfires in riparian areas. Large volumes of biomass can break loose during flood events damaging bridges and other man made structures.

Arundo can potentially reproduced by both sexual and asexual means. It flowers between March and September, but it is uncertain how much reproduction occurs by seed. Most reproduction is thought to occur from fragmented and transported rootstock. Arundo can be controlled by a combination of mechanical and chemical means, but control efforts must take place on a watershed scale with removal starting at the upper tributaries of the watershed and moving downstream.

- *Centaurea solstitialis* (yellow starthistle): An important candidate for weed management is yellow starthistle. In areas that it has yet to invade, such as most serpentine and roadless grasslands, the goal should be to prevent its introduction and/or spread. In areas where it is already abundant, such as in sites near most roads (especially on non-serpentine habitats), control and management can be effective.

  This species was probably first introduced into California in the mid-1800's, and has been spread along roads and other rights of way and throughout grasslands by vehicles, livestock, streams, wildlife, and wind (Roché and Roché 1988, Gerlach et al. 1998, Sheley and Petroff 1999). It germinates in the fall, grows a deep taproot while maintaining a small basal rosette, bolts in late May through the senescing canopy of annual grasses, and flowers during summer (Roché et al. 1994, Sheley and Petroff 1999). It is shade intolerant and prefers deep, fertile soils (Roché et al. 1994).

  Centaurea is abundant near roads (Roché and Roché 1988, Benefield et al. 1999, Gelbard and Harrison 2003), but has spread rapidly into adjacent grasslands, especially where vegetation and soils are disturbed (Roché and Roché 1988, Gerlach et al. 1998, Sheley and Petroff 1999). Its spread has intensified since the 1960's with the proliferation of road building, urbanization, and ranching (Gerlach et al. 1998). At the CRWA it occurs primarily along Maxwell Creek in an area that appears to have been grazed in the past.

- *Cortaderia sellanoa* (pampas grass): Pampas grass is a common ornamental plant native to Argentina, Brazil, and Uruguay that has escaped cultivation and spread along sandy, moist ditch banks throughout coastal regions of southern

California; its distribution appears to be expanding. It does not occur at the CRWA, but is abundant in Cache Creek, to the east of Blue Ridge. It threatens riparian areas at the CRWA via its potential to compete with native seedling trees, shrubs, and herbaceous plants and slow their establishment and growth (DiTomaso 2000). It also creates a fire hazard can reduce the aesthetic and recreational value of riparian areas.

Pampas grass is a perennial grass that grows 3-6.5 m tall, with long leaves rising from a tufted base. Its long-stemmed plumes consist of female flowers, deep violet when immature, then turning pink to white when mature. It flowers 2-3 years after germination, usually from late August through September, but sometimes in winter. Vegetative reproduction can occur when fragmented tillers receive adequate moisture and develop adventitious roots at the base of the shoot. Seedling establishment generally occurs in spring, requiring sandy soils, adequate moisture, and light; seedling survival is low in shaded areas or in competition with grasses or sedges. It is drought and heat tolerant, and once established, its roots can occupy a soil volume of up to 103 m^2, with roots spreading up to 4 m in diameter and 3.5 m in depth. Plants survive roughly 15 years (DiTomaso 2000).

- *Dipsacus sylvestris* (teasel): Teasel is large biennial that flowers on meter-high stalks that originate from basal rosettes. The rosettes and flowering stalks form dense stands, which include dried accumulated stalks from the past years' flowering. Teasel is a native of Europe, and is now a ubiquitous weed in the United States. In the vicinity of CRWA teasel occurs in pastures, wet areas and seeps. Within the CRWA itself there is a single occurrence of teasel along Pope Creek at the very upstream extent of the Maxwell Creek Unit. Teasel poses a particular threat to serpentine seeps because it appears capable of invading despite harsh soil conditions. Once established, it forms large monospecific stands that replace native seep vegetation.

- *Lepidium latifolium* (perennial pepperweed): Perennial pepperweed is a member of the mustard family native to Eurasia that threatens riparian areas by forming monospecific stands that exclude other plants (Corliss 1993, Trumbo 1994). In waterfowl nesting areas, it out-competes plants that provide food for waterfowl, and in hay meadows it reduces forage value. It does not yet occur at the CRWA but occurs within the Putah Creek watershed along both Knoxville and Eticuera creeks to the north.

  This noxious weed is a multi-stemmed herb that grows 1-2.5 m tall and contains a heavy, sometimes woody crown and spreading underground root system (Howald 2000). Stems and leaves are gray-green, and tiny white flowers, produced in May-July, occur in dense clusters at the tops of stems. Perennial pepperweed was first documented in California in 1936, and may have been introduced to California as a contaminant of sugar beet seed (Robbins et al. 1951). It may have also been introduced as a contaminant of straw bales used

to stabilize soils in roadside construction areas (Howald 2000). Perennial pepperweed prefers brackish to saline or alkaline wetlands, in full sun on heavy, moist soils, but is also found in native hay meadows and as a weed in agricultural fields where soil is slightly alkaline or saline, as well as drier sites (Howald 2000).

- *Taeniatherum caput-medusae* (medusahead): Medusahead is an annual grass that is widespread throughout oak savannahs and serpentine and non-serpentine grasslands at the CRWA. Of all species on the hot list, it is probably the best established at the CRWA. Medusahead is distinctive in grasslands because it reaches high densities and forms a uniform cover. Because of its high silica content medusahead is unpalatable to livestock or native herbivores, except in its earliest stages of growth. Unlike many other non-native annual grasses that decompose after seed set, medusahead persists through the winter and forms a dense thatch, which inhibits germination of native species and increases the likelihood and intensity of wildfire (Kan and Pollak 2000).

  Medusahead is native to the Mediterranean region. It was introduced to the United States in the late 1800s, but has spread widely throughout California only in the last 50 years. Medusahead can negatively affect the ecosystem by out competing and replacing native species, by tying up nutrients, and by increasing the intensity and frequency of fire. It also has a greater ability than many other non-native annual grasses to invade serpentine grassland.

- *Tamarix parviflora* (tamarisk, salt cedar): Tamarisk is a many-branched shrub or tree less than 26 feet tall with small, with scale-like leaves that contain salt glands, and small white to deep-pink flowers. Tamarisk is abundant along Pope Creek in both units of the CRWA, but uncommon along Maxwell Creek where there is at least one, but no more than a few plants along the stretch of creek within the CRWA.

  Tamarisk threatens the CRWA's riparian communities by causing dramatic changes in geomorphology, groundwater availability, soil chemistry, fire frequency, plant community composition, and native wildlife diversity (Lovich 2000). It traps and stabilizes alluvial sediments, resulting in narrowing of stream channels and more frequent flooding, and has been blamed for lowering water tables because of its high rates of evapotranspiration. Soil salinity increases due to inputs from salt glands on leaves, inhibiting growth of native riparian species (Anderson 1996), while leaf litter from the deciduous species increases fire frequency and alters soil chemistry to favor itself over potentially competing riparian species (Busch 1995).

  Tamarisk is native to Central Asia, from the Near East around the Caspian Sea, through western China and North Korea (Baum 1978). It may have been introduced into California by the Spanish, but was not recognized until the 1800's (Robinson 1965). It was intentionally introduced throughout the West to provide windbreaks, erosion control, and shade, and as an ornamental. It has spread via

seed and vegetative growth, with individual plants producing 500,000 tiny seeds per year (DiTomaso 1996), which are readily wind and water-dispersed. It also resprouts via roots (Lovich et al. 1994).

Table 2. "Hot list" of invasive species that have invaded or have the immediate potential to invade the Cedar Roughs Wildlife Area, and which are of a high priority for management due to potential severity of impacts and feasibility of control.

Scientific Name	Common Name	Serpentine	Riparian	Action
Present at the CRWA				
Aegilops triuncialis	barbed goatgrass	high	moderate	monitor, eradicate
Ailanthus altissima	tree-of-heaven	low	moderate	monitor, eradicate
Centaurea solstitialis	yellow starthistle	low	high	monitor, control and manage
Dipsacus sativus	teasel	moderate	high	monitor, eradicate
Taeniatherum caput-medusae	medusahead	moderate	low	Monitor, control and manage
Tamarix parviflora	tamarisk, salt cedar	low	high	monitor, manage
Not yet recorded at the CRWA				
Arundo donax	arundo, giant reed	low	high	monitor, prevent
Cortaderia sellanoa	pampas grass	low	high	monitor, prevent
Lepidium latifolium	perennial pepperweed	low	high	monitor, prevent

❖ Animal Species

Few data exist for vertebrates at the CRWA, and no targeted vertebrate surveys were conducted as part of the Planning Process. Vertebrate surveys were deemed low priority at the CRWA because its small size and because no major management activities are currently planned that would negatively impact populations of native vertebrates.

A breeding bird atlas has been recently published for Napa County (Berner et al. 2003). This atlas contains breeding bird records for 79 five kilometer-square blocks in the county. The CRWA occurs within two of these blocks. Breeding bird records for these blocks are listed in Appendix E, although many of the species found breeding in these blocks may rely on habitat that does not occur within the CRWA. In the spring and fall of 2003, surveys for birds (transects) and trapping for small mammals were conducted along Pope Creek (upstream starting at the confluence with Maxwell Creek) as part of a UC Berkeley study of the effects of tamarisk. Appendix E includes these bird data. Appendix E also includes birds that were observed by University or Department personnel conducting weed surveys in the CRWA in the winter of 2003/2004.

Four species of small mammal were recorded along Pope Creek as part of the UC Berkeley tamarisk study. These were the California meadow vole (*Microtus californicus*), the brush mouse (*Peromyscus boylii*), the pinyon mouse (*Peromyscus*

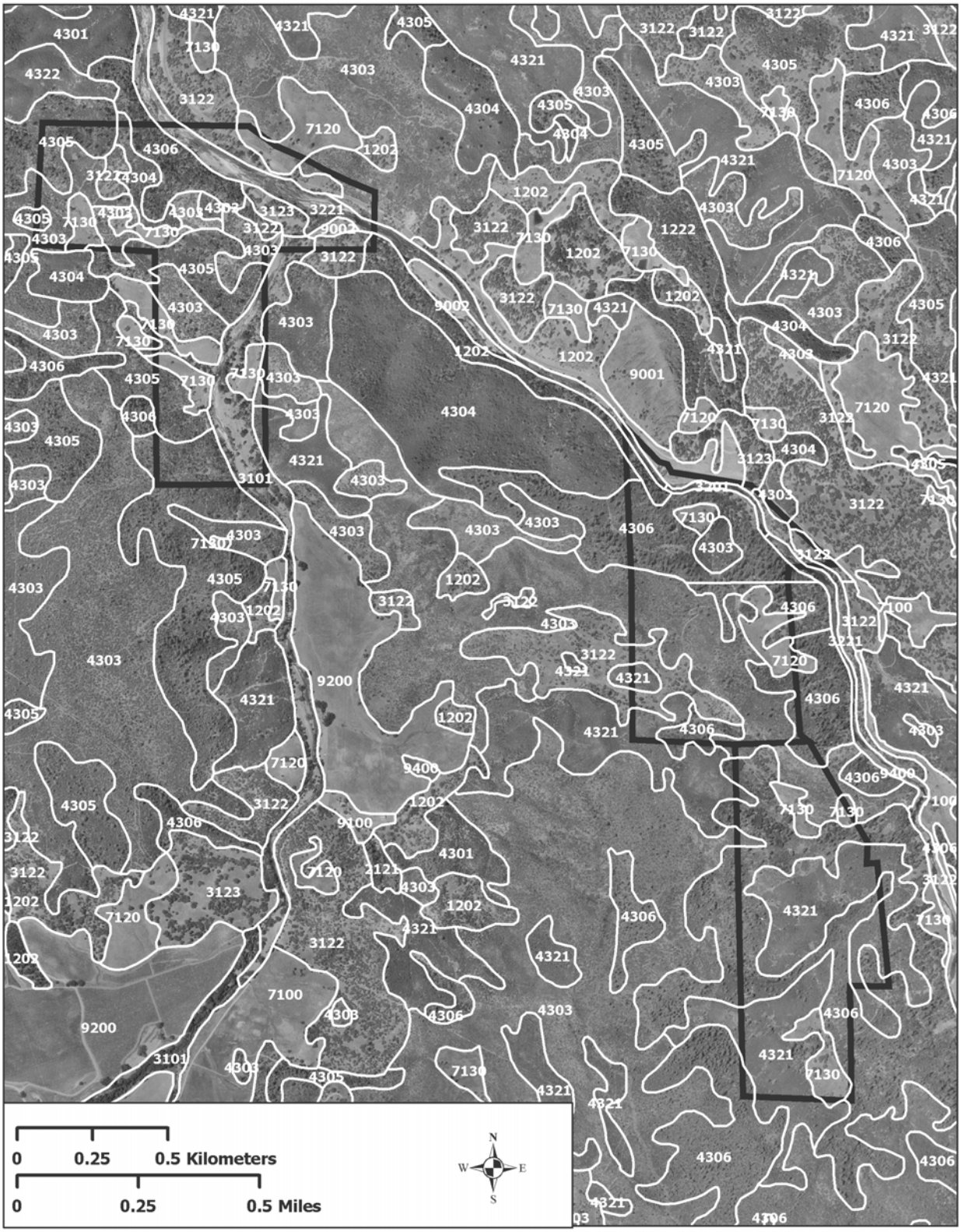
truei), and the deer mouse (*Peromyscus maniculatus*). Additional vertebrates that have been observed at the CRWA by UC Davis and Department personnel include the gray fox (Urocyon cinereoargenteus), common kingsnake (*Lampropeltis getulus*), northwestern pond turtle (*Clemmys marmorata marmorata*), and bullfrog (*Rana catesbeiana*).

❖ Animal Species of Special Concern

One special status vertebrate species, the northwestern pond turtle (*Clemmys marmorata marmorata*), was recorded by Department personnel on 15 April 2004. Many turtles were observed in each of several slow-moving pools in Maxwell Creek. This species is listed by the Department as a "Species of Special Concern." Western pond turtles occur in woodlands, grasslands, or open forests in ponds, marshes, rivers, streams, and irrigation ditches with rocky or muddy bottoms and emergent vegetation such as cattails or bulrush. They breed between April and August. Western pond turtles appear to be common in the greater Putah Creek watershed.

Maxwell Creek and Pope Creek may also provide habitat for another Species of Special Concern, the foothill yellow-legged frog (*Rana boylii*). Foothill yellow-legged frogs are recorded in the CNDDB in nearby Eticuera Creek and Spanish Valley. In addition, three bird species that are listed by the Department as Species of Special Concern are known or thought to breed in the two Napa County breeding bird atlas blocks that contain the CRWA. These include the osprey (*Pandion haliaetus*), the Cooper's hawk (*Accipiter cooperii*), and the tricolored blackbird (*Agelaius tricolor*). Osprey breed at Lake Berryessa and tricolored blackbirds in Pope Valley. Appropriate breeding habitat for these two species probably does not occur within the CRWA. Cooper's hawks may breed in riparian corridors, so it possible that they occur within the CRWA along Maxwell or Pope Creeks. It is also possible that California sage sparrows (also listed as a Species of Special Concern) occur or breed in the extensive chaparral in and around the CRWA.

Figure 4: Vegetation map of the Cedar Roughs Wildlife Area based on the Manual of California Vegetation and 1993 U.S. Geological Survey Digital Orthophoto Quads



IV. WILDERNESS ASSESSMENT

❖ **California Wilderness**

California is one of seven states that have a state wilderness acts complementing the Federal Wilderness Act of 1964. The California Wilderness Act (CWA) mirrors the federal act in most respects and is contained in the California Public Resources Code (PRC) at Section 5093.30-5093.40. PRC Section 5093.33(c) defines state wilderness as:

> an area of relatively undeveloped state-owned land which has retained its primeval character and influence or has been substantially restored to a near natural appearance, without permanent improvements of human habitation, other than semi-improved campgrounds and primitive latrines, and which is protected and managed so as to preserve its natural conditions and which:
>
> 1. Appears generally to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable.
> 2. Has outstanding opportunities for solitude or a primitive and unconfined type of recreation.
> 3. Has at least 5,000 acres of land, either by itself or in combination with contiguous areas possessing wilderness characteristics, or is of sufficient size as to make practicable its preservation and use in an unimpaired condition.
> 4. May also contain ecological, geological, or other features of scientific, educational, scenic, or historical value.

Once an area has been designated wilderness, the state agency with jurisdiction over the area must manage the new area to preserve its wilderness character. The following activities are explicitly prohibited in a state wilderness area.

- Commercial enterprises
- The construction of permanent roads
- The use of motorized vehicles or equipment except in emergencies involving the health and safety of persons within the wilderness area.
- The use of mechanical transport such as bicycles.
- The construction of new structures or installations.
- Livestock grazing, unless established prior to January 1, 1975.
- Flying of aircraft lower than 2,000 feet above the ground (except for aerial stocking of fish or aerial wildlife surveys).

The California Wilderness Act also specifically allows a number of activities, unless prohibited by another statute or agency policy. Permitted activities include:

- Hunting and fishing.
- Construction of primitive campgrounds or latrines.
- Control of fire, insects, and disease, including the use of mechanized equipment for these purposes if deemed desirable by the managing agency.
- The collection of hydrometeorological data and the conduct of weather modification activities.
- Access to private land that is completely surrounded by wilderness, even if such access requires construction of a new road across state wilderness.

❖ Suitability of CRWA for Preservation as Wilderness

The California Wilderness Act requires that the Secretary of the Resources Agency review and report on the suitability of all state-acquired roadless areas for preservation as wilderness within three years of their acquisition. Thus, as part of this management plan the Department has a responsibility to evaluate the suitability of the CRWA for wilderness designation. This evaluation consists of two components: (1) an assessment of whether all or part of the CRWA is eligible for wilderness designation (i.e., does it meet the minimum standard for wilderness?), and (2) a review of how wilderness designation would affect the ability of the Department to manage the area for the protection and enhancement of wildlife habitat and for the provision of wildlife-related public use opportunities.

Eligibility of the CRWA for wilderness – The CRWA by itself does not meet the minimum size requirements to be eligible for wilderness. However, the Lake Berryessa Unit is contiguous with the Cedar Roughs Wilderness Study Area, which exceeds 5000 acres and has already been deemed eligible for designation as federal wilderness. Thus the Lake Berryessa Unit, if it met the remaining criteria for wilderness eligibility, could be considered for wilderness status based on being contiguous to the Cedar Roughs Wilderness Study Area.

The first element of the California wilderness definition specifies that wilderness must have "a near natural appearance," be "without permanent improvements or human habitation," and "[appear] generally to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable."

The primary land uses at the CRWA since Europeans settled the area in the mid 1800s have been grazing and possibly homesteading. Ruins of a single cabin/barn and the scattered remains from a possible homestead or camp occur on the Lake Berryessa Unit, but these impacts are localized. The Unit does have the remains of several roads, but these have become largely overgrown, and where discernable have the appearance of foot trails. On the whole, the Lake Berryessa Unit, with its extensive stands of chaparral appears undisturbed by human activity.

The second element of the California wilderness definition is that the area has "outstanding opportunities for solitude or a primitive and unconfined type of recreation." In combination with the Cedar Roughs WSA, the CRWA has outstanding opportunities for solitude—currently, visitors to either area are unlikely to encounter another human being or to hear a motorized vehicle unless overlooking Pope Canyon Road. The potential for solitude is enhanced by the fact that the CRWA is centered within a much larger landscape (the 600,000-acre BRBNA) that has little development.

The third element of the California wilderness definition is that the area "has at least 5,000 acres of land, either by itself or in combination with contiguous areas possessing wilderness characteristics, or is of sufficient size as to make practicable its preservation and use in an unimpaired condition." As already discussed, the Lake Berryessa Unit, is contiguous with the 5600-acre Cedar Roughs WSA, managed by the BLM.

The fourth and last element of the definition is that "it may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value." The CRWA has significant ecological values. Its serpentine grasslands provide some of the few remaining snapshots of how California grasslands might have appeared prior to the arrival of Europeans and introduction of non-native annual grasses.

Compatibility of wilderness designation with the purpose of the CRWA— While the Cedar Rough Wildlife Area may be eligible for wilderness designation, such designation would not necessarily facilitate management activities to protect and enhance wildlife habitat. The Department must consider not only whether CRWA is eligible for wilderness designation, but also whether wilderness designation is compatible with the purpose of the CRWA.

The primary consequence of wilderness designation would be to prohibit motorized vehicles, mechanized equipment, and bicycles within the CRWA. The CRWA is currently not accessible by motor vehicles (except from adjacent private lands) because there is no crossing at Pope Creek, nor does the Department intend to develop access for motor vehicles. There is also little potential for bicycle use at the Wildlife Area because of the rugged terrain and absence of trails. Thus, wilderness designation would have minimal effect on the Department's management strategy, because those public activities that are both compatible with the purpose of the wildlife area and likely to occur are not restricted by the California Wilderness Act, and because management activities are likely to take place without motorized vehicles or equipment. The exception to this would be the use of chain saws, which would be necessary if tamarisk eradication were to take place in Pope Creek.

Wilderness designation for the Lake Berryessa Unit would not be meaningful unless the Cedar Roughs WSA receives federal wilderness designation. The main benefit of such an action for the CRWA would be to promote regulatory consistency between the federal wilderness and the Department lands that provide access to it, however, designation of only a portion of a wildlife area as wilderness is not practical in a regulatory sense.

V. COMPATIBLE PUBLIC USE

The Cedar Roughs Wildlife Area was acquired by the Department to protect and enhance habitat for wildlife species, and to provide the public with wildlife-related recreational uses. The Cedar Roughs Wildlife Area offers the public remoteness and natural beauty, potential encounters with diverse wildlife species and unique plant communities, but these attractions are offset by rugged terrain and difficult access. Because of this mix of attractions and challenges, the CRWA is likely to attract a limited variety of recreational and other public uses. A critical component of this plan is evaluating what public uses are compatible with the protection and enhancement of wildlife habitat, and to outline what management activities or regulations on public use may be necessary to fulfill this primary purpose.

Hiking and deer and upland game bird hunting have been the primary public uses at the Cedar Roughs Wildlife Area since the Department acquired the property in 1995. These uses have been largely dependent on and compatible with the protection of wildlife habitat. In addition to considering such existing uses in this Plan, the Department has a responsibility to anticipate future demand for uses that do not at this time regularly occur (e.g., bicycling, horseback riding) or are currently prohibited (e.g., vehicular travel), and to evaluate their compatibility with the wildlife area purpose.

❖ Wildlife Area Regulations

Public use of all Wildlife Areas is regulated by the Department pursuant to the California Code of Regulations, Title 14 (Natural Resources), Division 1, Sections 550 and 551. Division 1 of Title 14 contains regulations that have been formally adopted by the California Fish and Game Commission, reviewed and approved by the Office of Administrative Law, and filed with the Secretary of State. Section 550 contains Regulations for General Public Use Activities, which are applicable to all Wildlife Areas. Section 551 contains Hunting, Firearms, and Archery Equipment and Permit Requirements, which include hunting regulations applicable to all Wildlife Areas as well as general public use regulations that apply to specific Wildlife Areas. In addition, standard hunting and fishing regulations apply to all Wildlife Areas.

Although regulations can be tailored to specific Wildlife Areas (see Section 551, subsection q), Sections 550 and 551 should be viewed as a framework within which public use can be addressed in this plan. By identifying activities that are incompatible with the wildlife area purpose, existing regulations may in some cases impose constraints on the management of public use at the CRWA. For this reason, current regulations that apply to the CRWA are provided as a reference for the reader. This summary does not elaborate all requirements in detail and regulations are expected to change over time, so current regulations should be consulted for any determination

about lawful use of a Wildlife Area. These regulations are available at the Fish and Game web site, and are published annually in a booklet.

In Section 550, all Wildlife Areas are classified as Type A, B, or C. Type A and B areas require specific permits or season passes, whereas Type C areas usually do not. Cedar Roughs Wildlife Area is currently designated as a Type C area with no required permits or passes and no specified daily hunter capacity.

General Public Use Regulations (Section 550)—The following regulations set basic standards for protection of all Wildlife Areas and for the protection of public safety. In addition, the Regional Manager has authority to establish additional regulations that are not listed in sections 550 or 551. The regulations listed are currently applicable to all Wildlife Areas, including Cedar Roughs. Where regulations require a specific action by the Department to be applicable (e.g., the designation of roads or trails), the status of any such action for Cedar Roughs is noted in italics.

- The Department may specify entry locations, limit entry or close wildlife areas to protect resources or public safety. Specified public notice is required of such entry limitation or closure. *No entry locations, limitations or closures have been established at CRWA.*
- Use permits are required for organized events or gatherings.
- Motor vehicles and trailers are not permitted except on public roads, parking areas or other trails designated by the Department. *No such trails or parking areas are yet designated (signed) at the CRWA. Parking is currently available only in turnouts along Pope Canyon Road.*
- Drivers must comply with all traffic signs posted by the Department.
- Certain activities are not permitted. Prohibited activities include:
    - Damage or removal of property owned by others.
    - Depositing of litter, rubbish, or toxic substances.
    - Damage to plants, except vegetation may be cut for building blinds.
    - Removal of soil, sand, gravel, rock, etc.
    - Collection, disturbance or removal of bottles or artifacts.
    - Camping except in designated areas. *No camping areas have been designated at CRWA*
    - Open fires from April 30 through October 30.
    - Livestock grazing, except with a permit. *No grazing permits have been issued for the CRWA.*
    - Taking fish or frogs for commercial purposes.
    - Possession of alcohol in all areas except designated parking areas.
- Hunting and fishing is permitted subject to regular open season and regulations and the special provisions of Section 551.
- Dogs are allowed only for hunting or only when under immediate control. The Department may prohibit or restrict the use of dogs. The use of dogs for the pursuit/take of mammals or for dog training is also regulated pursuant to Section 265(a)(1)-(4). Section (4) states: the use of dogs for the pursuit/take of mammals or for dog training is prohibited from the first Saturday in April through the day

preceding the opening of the general deer season in the Central California Dog Control Zone (Napa County north of Highway 128 and east of Highway 29; Lake County east of a line beginning at the Lake-Napa county line and Highway 29). *There are no additional restrictions on dogs at CRWA.*
- The Department may eject a person from the Wildlife Area for specified reasons.
- Users are responsible for knowing area-specific regulations in Section 551.

Hunting, Firearms, and Archery Equipment and Permit Requirements (Section 551)—Section 551 contains regulations related to hunting and firearms, and also includes regulations that are specific to particular Wildlife Areas. Hunting and firearm regulations that apply to the CRWA include the following:

- Except for designated shooting areas or with a special permit, possession and use of firearms and archery equipment is permitted only for hunting (i.e., no target shooting or "plinking"). The only exception is that an adult-supervised youth (under the age of 16) may possess and discharge a BB gun. A BB gun may not be used to take wildlife. *No shooting areas have been designated at the CRWA.*
- Shotgun shells shall not contain shot size larger than BB in lead and size T in steel. Shotguns with slugs may be used for hunting big game.
- Loaded firearms are prohibited in parking lots.
- Raptors may be used to take legal game in accordance with general hunting regulations.

There are no additional regulations specific to the CRWA.

❖ Evaluation of Public Use Compatibility

Table 3 provides a list of activities at the Cedar Roughs Wildlife Area for which there is current or potential public demand. This list was compiled from a variety of sources, including: (1) observations of public use by the authors during surveys of the CRWA, (2) discussions with Department staff familiar with the CRWA (primarily Phil Pridmore, Mike Lewis, Jim Swanson, and Tina Fabula), (3) discussions with members of the Trails and Recreation Committee of the BRBNA Conservation Partnership as well as other interested partners, and (4) public input from two public input meetings held in 2003 (Appendix A).

The compatibility of particular uses was evaluated using four main criteria: (1) the degree to which the use is dependent on or related to wildlife, (2) the potential for the use to negatively impact wildlife habitat or wildlife populations, (3) the potential for conflict with other compatible uses, and (4) the level of management needed to support the use and the ability of the Department to provide the necessary resources. Uses were classified based upon whether they are wildlife dependent (e.g., hunting, bird watching, wildlife photography), wildlife related (e.g., hiking), or not wildlife related (e.g., some forms of off-highway vehicle use). Some activities could fall under more than one

category, depending on the objective of the participant. For example, bicycling and OHV use may be wildlife-related when used in support of hunting, but are generally not wildlife related when pursued as an end in themselves. Uses were further classified (low, moderate, or high) based on the degree to which they are likely to impact wildlife habitat, conflict with other uses, and demand resources from the Department (Table 3). Potential impacts to wildlife habitat were estimated from a review of the literature on the impact of outdoor recreation on natural environments.

Table 3. List of uses for which there is existing or potential demand at the Cedar Roughs Wildlife Area, and classification for four criteria to determine whether uses are compatible with the Wildlife Area purpose. Compatible uses are listed in boldface type.

Use	Relation to Wildlife			Potential to impact habitat or wildlife	Potential to conflict with other uses	Required level of management
	Dependent	Related	Unrelated			
Wildlife observation and photography	X			low	low	low
Academic research	X			low	low	moderate
Environmental education	X			low	low	moderate
Hunting	X			moderate	moderate	low
Hiking		X		low	low	low
Primitive camping		X	X	moderate	low	low
Horseback riding		X	X	high	low	moderate
Bicycle riding		X	X	moderate	moderate	moderate
Off-highway vehicle use		X	X	high	high	high

In determining which uses are compatible with the purpose of the CRWA, priority was given to wildlife dependent activities. To the extent that particular wildlife dependent activities have the potential to impact wildlife habitat or conflict with other uses management activities are proposed to minimize impacts and avoid conflicts. Secondary priority was given to wildlife related activities that have little potential to impact wildlife habitat or conflict with other uses, and which require low or moderate management support. Activities that are not wildlife related were considered incompatible with the purpose of the CRWA.

Eight activities were determined to be compatible with the protection and enhancement of wildlife habitat. These activities are wildlife observation and photography, academic research, environmental education, hunting, hiking, primitive camping, horseback riding, and bicycle riding. Off-highway vehicle use was considered incompatible with the purpose of the CRWA. Three activities—horseback riding, bicycle riding, and primitive camping—do have the potential to negatively impact wildlife habitat or to conflict with other uses. However, it is anticipated that without substantial access improvements to or trail development within the CRWA, these activities are likely to occur only rarely, if at all, and should not cause significant impacts.

Wildlife observation and photography—The Cedar Roughs Wildlife Area provides unique opportunities for wildlife observation and photography. The rugged terrain provides stunning views and the serpentine plant communities produce unique floral displays.

Academic research—The Cedar Roughs Wildlife Area provides limited opportunities for pure and applied research. As part of a much larger landscape that is dominated by serpentine substrates, the CRWA may serve as a study site for academic research on the evolution and ecology of organisms that occur in this unique environment. It has already served as a field site for a geographic scale study of serpentine seeps. The CRWA is close to three biological field stations—the Quail Ridge Reserve and the McLaughlin Reserve (both operated by UC Davis) and the Wantrup Wildlife Sanctuary (operated by the Land Trust of Napa County). Users of these field stations are likely to consider the CRWA as a potential field site for studies of organismal biology, evolution, and ecology, as well as for applied studies of invasion biology. Proposals for research use will be evaluated by the Department to ensure that such use does not unreasonably impact wildlife habitat.

Environmental education—The CRWA has limited value as a site for environmental education because of its remoteness, difficult access, and lack of trails. Nevertheless the CRWA may be an attractive site for university level classes based at nearby field stations, particularly because it is one of the closest examples of a serpentine dominated landscape accessible from the Wantrup Wildlife Sanctuary and from the Quail Ridge Reserve. Proposals for class use will be evaluated by the Department to ensure that such use does not unreasonably impact wildlife habitat.

Interpretive displays or kiosks at key access points probably provide the greatest potential to educate the public about the unique geology and biology of the CRWA. Such displays or kiosks would likely combine interpretive material with regulatory and safety information. Production and periodic maintenance of such displays would depend on an increase in funding and staffing for the CRWA.

Hunting—Hunting is a primary public use provided for in the regulations governing Wildlife Areas. Deer and upland game bird hunting has been a primary public use at Cedar Roughs over the past few years, and hunters were strongly represented at both public input meetings. There are no restrictions on hunter numbers at the CRWA, but at some Wildlife Areas the Department uses a permit system to regulate the number of hunters to manage wildlife populations or to minimize conflicts among hunters or between hunters and non-hunters. The Department has received no reports of conflicts among hunters or between hunters and non-hunters at the CRWA, so the current system of unregulated access appears appropriate. As with other recreational activities, the CRWA probably has limited attraction for hunters because of its difficult terrain and challenging access. In addition to the direct recreational benefit of hunting, regulated hunting provides the Department with a potential tool to manage wildlife populations or habitats.

Hiking—The CRWA contains about a one-mile segment of Dollarhide Road (in the Maxwell Creek Unit) as well as several miles of unmapped ranch roads (mostly in the Lake Berryessa Unit). At its north end, Dollarhide Road terminates on the south side of Pope Creek (there is no crossing to Pope Canyon Road) and at its south end it continues on to private property. In the Lake Berryessa Unit, an old unnamed ranch road starts on the south side of Pope Creek and winds through the north end of the Unit as well as across BOR and private land before terminating at the south end of the Unit. A branch from this road enters BLM land to the west of the Unit. These roads are not maintained and some segments are so overgrown that they are difficult to find on the ground. Nevertheless these roads are the primary routes used by hikers and others traversing the CRWA. The primary limitation of the existing roads within the Lake Berryessa Unit is that they do not connect to the BLM Cedar Roughs WSA without traversing private property.

A high priority concern in both public meetings was integrating the CRWA into a regional trail system encompassing BLM lands to the South and BOR lands to the East. For example, the CRWA could provide a linkage between a trail originating at Lake Berryessa and leading in to the Cedar Roughs WSA. The ability to provide such a linkage is severely constrained by the steep terrain and dense vegetation connecting the CRWA to the Cedar Roughs WSA. Potential routes will require careful evaluation to ensure that trails do not result in erosion, safety hazards, or unreasonable maintenance requirements.

Primitive camping—Currently camping is prohibited within the CRWA. There is evidence that some illegal camping has occurred in the past within the Lake Berryessa Unit, on the south side of Pope Creek. In the absence of developed camping areas, the CRWA is unlikely to attract much camping use. The chaparral provides few attractive camping sites due to the lack of clear and level ground. Development of permanent campgrounds is currently undesirable because of potential degradation of wildlife habitat (through vegetation trampling, firewood collection, and littering), and because permanent campgrounds have high maintenance costs. The Department will consider amending the regulations to allow primitive camping as an option to hunters and backpackers who would like the opportunity for more than just day use of the Wildlife Area. This would promote regulatory consistency between the CRWA and the Cedar Roughs WSA (where camping is allowed). Maintaining regulatory differences between the CRWA and the Cedar Roughs WSA is inefficient because in most areas the boundary between the two areas is not signed.

Horseback riding—Horse riding occurs infrequently, if at all, at the Cedar Roughs Wildlife Area. Because of their high weight and relatively small area in contact with the ground, horses have potential to cause substantial environmental damage. Several studies have shown that horses can cause as much or even greater damage than motorcycles (Landsberg et al. 2001). Horses cause environmental damage directly by trampling vegetation and promoting soil erosion, but can also contribute the spread of weeds. The potential for spread of weeds occurs because many seeds can pass

unharmed through the digestive tracts of horse (sometimes as long as 13 days), and because many dried stock feeds are rich in weeds.

Horse impacts tend to be greatest off-trail or on trails that are steep or boggy. Limiting horse access to relatively level, well-maintained trails during the dry season can minimize environmental damage. Because of limited access and steep terrain, there is unlikely to ever be appreciable demand for horse riding at the CRWA. At this point in time the cost of instituting or regulations on horse riding is not justified, because there are no evident or anticipated impacts of horse riding. If future management activities within the CRWA or on adjacent public lands increase the attraction of the CRWA to horse riders, then the Department may consider regulations that limit horse riding to the dry season on established trails having a slope that is mostly ≤ 10%, or it may consider prohibiting horse riding entirely.

Bicycle riding—Like horse riding, bicycle riding has not and is not likely to become more than a rare activity at the Cedar Roughs Wildlife Area. The environmental impacts of mountain bikes, although hotly debated, are not well established. Some studies have shown that, compared to hikers, bikes have similar or even lesser effects on vegetation and sediment movement (Wilson and Seney 1994, Thurston and Reader 2001). Impacts from bicycles will depend largely on the style of riding, with the greatest impacts occurring during skidding, or when riding at high speed, in wet conditions, or off trail. While bicycles may have less environmental impacts than horses, there is a widespread view that trail use by mountain bikes often conflicts with use by hikers and equestrians.

Impacts of bicycles on the environment can be minimized with access restrictions that are identical to those for horses: bicycle riding can be permitting during the dry season on established trails having a slope that is mostly ≤ 10%. Additionally, speed restrictions on bicycles can increase safety and prevent conflicts with equestrians and pedestrian. As with horse riding, there are no observed or anticipated impacts of bicycle riding at the CRWA, and so there is no need for the Department to regulate or prohibit bicycle riding at this time.

Off-highway vehicle use (incompatible)—Off-highway vehicles (jeeps, motorcycles, or four-wheeled all terrain vehicles [ATVs]) are currently prohibited at the Cedar Roughs Wildlife Area. Operation of such vehicles purely for sport is an activity that is unrelated to wildlife with great potential for environmental damage, and is therefore deemed incompatible with the purpose of the wildlife area. Off-highway vehicles (OHVs) can also be used to support hunting, which is a wildlife-dependent activity, and for this reason the Department carefully considered the potential to increase off-highway vehicle access at the CRWA for hunters.

Responsible use of off-highway vehicles on existing trails may have effects that are comparable to those caused by horses and hikers. At least one study has demonstrated that use of motorcycles or OHVs at low speeds on existing trails may result in even less sediment loss than use by horses and hikers (Wilson and Seney 1994). Studies of off-highway vehicle impacts off-trail have reached widely divergent

conclusions, e.g., some showing that the effect of motorcycles is intermediate between hikers and horses (Weaver and Dale 1978, Weaver et al. 1979) and another concluding that one motorcycle pass has greater impact on vegetation than 500 pedestrian passes (Kutiel et al. 2000). Much of the discrepancy may be due to dependence of impacts on the vegetation and soil type. Despite conflicting experimental studies, there is widespread documentation of extensive vegetation damage and soil loss due to off-highway vehicle use (Brooks 1995, Lovich and Bainbridge 1999, Priskin 2003).

Much of the potential for off-highway vehicles to cause environmental damage stems from the ease (relative to equestrians and hikers) with which operators can establish new trails. This is particularly true in areas with extensive herbaceous vegetation. At the CRWA, there are four difficulties with allowing hunters to use OHVs on existing trails: (1) existing trails are not well defined and creating defined trails would involve substantial construction and maintenance costs [particularly providing crossings at Pope Creek], (2) without significant law enforcement it would be difficult to prevent scofflaws from blazing new trails through herbaceous vegetation types, which at CRWA are also the most sensitive plant communities (serpentine grasslands and seeps), (3) many existing trails lead to private property, and (4) allowing OHV use would create regulatory inconsistency with the Cedar Roughs WSA (where motor vehicles are prohibited) and could promote OHV trespass in this area. An additional impact of allowing off-highway vehicle access would be increased noise pollution. Vehicle noise might not have direct effects on wildlife, but would most certainly diminish the quality of experience of other Wildlife Area users. Because of this potential for noise pollution and because of the considerable environmental damage that would likely ensue in the absence of adequate resources to enforce regulations limiting vehicles to existing trails, the Department has concluded that off-highway vehicle access for hunters is incompatible with the purpose of the CRWA.

❖ Coordination to Support Public Use

The Cedar Roughs Wildlife Area is part of mosaic of public lands within the Blue Ridge-Berryessa Natural Area, and management to support compatible public uses of the Wildlife Area will require coordination with other entities—particularly the Bureau of Land Management, the Bureau of Reclamation, and the BRBNA Conservation Partnership. Coordination will be particularly important for regional trail planning, providing access to and from the Wildlife Area, accommodating overnight camping in the region, and for ensuring regulatory consistency (to the degree possible) between public lands managed by different agencies.

Regional trail planning—A planning program for a regional trail system in the Blue Ridge Berryessa Natural Area was recently initiated by the Trails and Recreation Committee of the BRBNA Conservation Partnership. The Department should work closely with the Committee, BLM, and the BOR to determine whether the existing network of roads within the CRWA could be integrated into this plan.

Unauthorized access—The Department is committed to working with and respecting the rights of private property owners adjacent to the CRWA. Existing roads within the CRWA tend to promote trespass by the public onto private lands, and also vehicular trespass from private lands into the CRWA. The existing BLM handout for the Cedar Roughs WSA depicts a boat in access trail from Pope Creek through the CRWA to the boundary of the Cedar Roughs WSA. On the ground however, this trail crosses private land. Conversely, tracks found on the ground during weed surveys are evidence that four-wheeled ATVs occasionally enter the Lake Berryessa Unit of the CRWA from private lands to the West. Preventing unauthorized access will require a cooperative effort between the Department, BOR, BLM, and adjacent private landowners.

Additional camping—The capacity of the CRWA to provide opportunities for camping is limited. An alternative to allowing camping at CRWA may be to redirect campers to sites on adjacent BOR land.

Regulatory consistency—Regulatory consistency between the CRWA and other public lands in the region may be a limited possibility because the mission of the Department and the purpose of the CRWA differ from those of other agencies. Currently there are several points of regulatory inconsistency between the CRWA and adjacent lands administered by BOR and BLM (Table 4).

Table 4. Comparison of regulations at the Cedar Roughs Wildlife Area (Fish and Game), the Cedar Roughs Wilderness Study Area (BLM), and the Lake Berryessa Recreation Area (BOR).

Activity	**CRWA** (California Department of Fish and Game)	**Cedar Roughs WSA** (Bureau of Land Management)	**Lake Berryessa Recreation Area** (Bureau of Reclamation)
Camping	prohibited	Allowed	prohibited except at established campgrounds
Open fires	prohibited April 30-October 30	prohibited during declared fire season, permit required otherwise	prohibited
Carrying of firearms	allowed	Allowed	permit required
Target shooting	prohibited	Allowed	prohibited
Hunting	allowed	Allowed	prohibited

Many users of the CRWA are likely to traverse Department land, BOR land, and BLM land during a single visit. The Department may work with the BOR and BLM to improve regulatory consistency among the different land management units, but to the extent that this is not possible, it will be important to inform the public about how regulations

change from unit to unit, and to indicate on the ground where boundaries between these units occur.

❖ Management to Support Public Use

Proposed management activities to support the compatible public uses are grouped into five categories: (1) public information and outreach, (2) access improvements, (3) hunting and wildlife, (4) facilities, and (5) research and education. Management goals and tasks are described in detail in Chapter VI, and are summarized briefly here.

Public information and outreach—Ensuring that only appropriate public use occurs at the CRWA currently depends on informed user groups and a responsible public. The Department of Fish and Game's Lands and Facilities website at www.dfg.ca.gov/lands/ currently provides only cursory information on how to find the CRWA. The regional office provides a general topographic map with the CRWA's specific regulations to callers requesting such information. Other than a few Wildlife Area boundary signs, information on allowed activities at the CRWA is lacking. The control of prohibited uses and general regulatory oversight is limited because there is no vehicular access for game wardens. The Department will need to increase the availability of information available to the public by both improving the existing information channels and increasing the information on site

Access improvements—Public access into and through the CRWA was a high priority issue at both public input meetings. The goal of the Department is to improve public access for compatible uses, while protecting sensitive plant and animal populations and archaeological sites. The Department will discourage trespass or poaching on adjacent private lands and integrate the CRWA into a regional trail system, provided that such integration can be accomplished without threatening sensitive plant and animal populations and without imposing unmanageable maintenance costs. Specific management actions may include:

- Installation of additional boundary signs along Pope Canyon Rd.
- Installation of boards or kiosks with regulatory, safety, and interpretive information.
- Working with BRBNA Conservation Partnership, BOR, BLM, and other groups to identify potential regional trail routes.

In compliance with federal and state law, the Department will evaluate the provision of accommodations for disabled persons within its programs and facilities.

Hunting and Wildlife—The Department is committed to provide long-term opportunities for hunting and to restoring or improving wildlife habitat to increase the potential for wildlife-related and wildlife-dependent activities at the CRWA. Specific management actions will include:

- Managing vegetation to support game as well as non-game populations.

Facilities—The CRWA currently provides no public facilities. Access to the Lake Berryessa Unit could be improved by providing a small graveled parking area along Pope Canyon Road. Developed campgrounds are incompatible with the purpose of the wildlife area, but the Department may consider allowing primitive hike-in camping. Specific management actions may include:

- Considering the need for a parking area at the Lake Berryessa Unit
- Considering the feasibility of allowing primitive camping.

Research and Education—The Department will promote research and educational use of the CRWA, and in particular will encourage and support research that will assist in the Department's management of the area and its wildlife.

VI. MANAGEMENT GOALS AND TASKS

❖ Definition of Management Terms

Consistent terminology is used by the Department for clarifying management goals. To acquaint the reader with this terminology, the following terms and meanings are established for use in this Plan.

- **Element:** Any biological unit, public use activity, facility maintenance or management coordination program as defined below for which goals have been prepared and presented within this Plan.

- **Biological Element:** Any vegetation type, plant community, habitat, or species for which specific management goals have been developed within this Plan.

- **Public Use Element:** Any recreational use or other activity appropriate to and compatible with the purposes for which this property was acquired.

- **Facility Maintenance Element:** Any maintenance and administrative program that helps provide for orderly and beneficial management of the Wildlife Area.

- **Management Coordination Element:** Any management program that involves coordination with entities outside of the Department, such as the Blue Ridge-Berryessa Natural Area Conservation Partnership, BLM, the University of California, and other public and private entities with an interest or a management role in the region.

- **Biological Goal:** A statement of the intended long-range results of management to enhance, restore, or control any biological element.

- **Public Use Goal:** A statement of the desired type and level of public use compatible with the biological goals previously specified within this Plan.

- **Management Coordination Goal:** A statement of the desired type and level of management coordination that is required to achieve the biological and public use goals previously specified within this Plan as well as the greater goals of the Blue Ridge-Berryessa Natural Area Conservation Partnership.

- **Tasks:** A specific project necessary to achieve a goal and which is useful to define for purposes of planning operation and maintenance budgets.

The management program is organized into elements, goals and tasks, which establish a hierarchy of management direction for the Wildlife Area. *Elements* define the broad

categories of consideration, *goals* define objectives within the *elements,* and *tasks* establish specific actions to attain the *goals*. Elements themselves are somewhat hierarchical, with broader categories of consideration (e.g., the watershed) listed before specific ones (e.g., priority vegetation types). Together the elements, goals and tasks guide the management of the Wildlife Area.

❖ Biological Elements

This Plan adopts an integrative ecosystem approach to resource management and as a result biological elements are defined broadly. The approach is based on the principle that maintaining a healthy ecosystem is the most efficient way to ensure healthy populations of native wildlife, including rare and sensitive plants and animals and game species. The overarching goal of this plan is to provide for the maintenance and restoration of healthy ecosystem function within the CRWA, and to the extent possible, within the greater Pope Creek watershed. The three biological elements addressed in this Plan are as follows:

1. Pope Creek ecosystem and watershed.
2. Priority vegetation types: serpentine grasslands and seeps and riparian.
3. Special status species: plant and animal.

Game species are not included as a separate element because the small size of the CRWA makes it impractical to actively manage populations of most game species (deer, turkey, other upland birds) that are typically hunted in the region.

Biological Element 1: Pope Creek ecosystem and watershed.

Ecosystems function through a number of processes that involve both biotic and abiotic components, including:

- the cycling of water and nutrients through the environment.
- primary production via photosynthesis and transfer of energy through food webs.
- the maintenance of native biodiversity through natural interactions among species (e.g., competition, pollination, herbivory, parasitism, and predation) and
- natural disturbance regimes such as fire and flooding and wind fall of trees.

A number of threats to healthy ecosystem function at the CRWA have already been identified in this plan. Foremost is the threat posed by invasive plant species such as barbed goatgrass, tamarisk, arundo, and perennial pepperweed. These species have the potential to dramatically alter ecosystems and to replace entire communities of native plants and animals. They do so by competing directly with native plant species,

by changing stream flow dynamics and soil chemistry, and by forming monotypic stands that provide habitat for few wildlife species. Secondary threats to healthy ecosystem function at the CRWA include unnatural disturbance regimes, such as inappropriate fire frequency (either a decrease in fire frequency due to fire suppression, or an increase due to human ignition), inappropriate grazing intensity, and increased soil erosion and stream channelization. Unfortunately, unnatural disturbance regimes frequently interact with invasions by exotic species in positive feedback loops. For example, invasion by grasses into shrubland can increase the potential for fires, and increase in fire frequency may further facilitate the invasion.

The Department has limited ability to manage for healthy ecosystem function within the greater Pope Creek watershed, because the CRWA encompasses only a tiny fraction of the land area within this watershed. Nevertheless, the Department can support and participate in cooperative management programs at the watershed scale. The primary mechanisms by which the Department can maintain healthy ecosystem function at the CRWA is through control of invasive species, maintenance of natural disturbance regimes, and maintenance of natural species diversity and interactions.

Biological Goal 1.1. Monitor critical aspects of ecosystem function.

Maintenance of healthy ecosystem function at the CRWA requires an initial assessment of threats to ecosystem function to establish management goals and priorities. Some of this initial assessment, particularly with respect to invasive species, has been completed as part of this Plan. This Plan proposes an adaptive approach to the management of the CRWA. Adaptive management is a process by which the Department modifies management goals and tasks in response to new information. Threats to the ecosystem, as well as the success of management actions, require periodic reassessment so that management priorities and techniques can be adjusted for maximum effectiveness. This reassessment can be accomplished with a monitoring program that targets likely threats to ecosystem function and important indicators of ecosystem health.

> *Task 1.1.1. Inventory to identify and map invasive species that are likely to have severe impacts on ecosystem function and to establish a baseline against which to assess future condition.* Between August 2003 and August 2004, personnel from UC Davis and the Department (Paul Aigner, Catherine Koehler, Tina Fabula, and Jake Rugyt) conducted surveys for invasive species in grasslands and some riparian zones within the CRWA. These surveys targeted the species included in Table 2 (Appendix B). Surveys were limited to areas mapped as California annual grassland and serpentine grassland on the Napa County MCV vegetation map, and to the major riparian corridors along Pope Creek and Maxwell Creek. The surveys also identified areas with relatively dense cover of native bunchgrass (primarily *Nassella* spp.), which can be used as seed sources or starting points for grassland restoration.

Task 1.1.2. Design and implement a program of long-term vegetation monitoring at the CRWA. The primary objective of a vegetation monitoring program at the CRWA is to provide information about the spread of important invasive species. Inventories will be conducted on a regular basis to map additional weed species that were not included in this initial round of mapping, to monitor the appearance of new weed populations, to distinguish small satellite populations from large infestations, and to monitor the spread or treatment of large infestations. Inventory techniques will depend on the target species, but will usually rely on ground mapping in the field. If resources permit, vegetation monitoring may be expanded to include secondary goals, such as assessing the status of priority vegetation types or special status species.

Task 1.1.3. Design and implement a program to monitor the success of management activities.

Biological Goal 1.2. Prevent the introductions and spread of new invasive non-native species.

There is virtual consensus among scientists and land managers that prevention is crucial when it comes to combating the spread of weeds (Mack et al. 2000). Once an invasion occurs, eradication, control, and restoration are expensive, time-consuming, and difficult endeavors.

Task 1.2.1. Monitor hot spots of introduction to enable early detection and rapid eradication of invasives (e.g. sites along roads, trails, streams, near buildings/parking areas, in turnoffs, etc.). Such hot spots should be surveyed regularly to enable early detection and eradication of new invaders and satellite populations of existing invaders. Monitoring should be conducted in each hot list weed species' preferred habitat, as appropriate per species.

Task 1.2.2. Clean vehicles and clothing after leaving infested areas and before entering uninfested habitats. To the extent possible equipment and vehicles used by the Department for maintenance and other administrative functions within the CRWA should be cleaned prior to entering and after leaving the CRWA. This is particularly important if the equipment has been used in other areas with invasive species that have not yet established at the CRWA.

Task 1.2.3. Provide education and outreach. An important component of prevention will be to provide outreach to educate CRWA users as to measures they can take to prevent introducing invasive species at the CRWA. Such outreach could take the form of flyers or handouts at a kiosk along Pope Canyon Road

Biological Goal 1.3. Detect and eradicate existing small populations of invasives.

Species such as arundo, pampas grass, and perennial pepperweed occur in the greater Blue Ridge-Berryessa Natural Area, but have not yet established in the CRWA. Others, such as tree-of-heaven, teasel, barbed goatgrass and yellow starthistle occur in small infestations that are feasible to eradicate. Eradicating a satellite or newly-established population is always more cost-effective than controlling a large infestation, so eradication of small populations will generally take precedence over controlling large infestations.

Task 1.3.1. Eradicate small infestations of "hot-list" species. Hot list species (Table 2) that are only beginning to invade the CRWA or occur small patches should be eradicated annually or as resources permit. Eradication plans for barbed goatgrass, teasel, tree-of-heaven, and yellow starthistle are given in Appendix F.

Biological Goal 1.4. Control and manage existing infestations of established invaders.

Invasions of some hot-list species at the CRWA are too advanced to be eradicated (e.g., medusahead) or will require regional coordination to be eradicated (tamarisk). Such infestations should be controlled and managed to (1) prevent their expansion and spread, and (2) gradually shrink them. When resources permit, such areas should be targeted for restoration measures such as controlled burns and native reseeding, following the best available scientific advice (e.g., DiTomaso et al. 1999).

Task 1.4.1. Identify non-native species that have invaded the CRWA, and prioritize management of particular weed species based on potential impacts to ecosystem function and feasibility and impacts of control. This task is accomplished by this plan. Non-native species that have invaded the CRWA are identified in Table 2, and the prioritization of management actions for these species is developed in Appendix F. Highest management priority should be given to infestations (1) that pose the greatest threat to priority vegetation types and weed management goals, (2) that remain localized or otherwise sparsely present on the CRWA, and (3) for which feasibility of eradication or control is greatest.

Task 1.4.2. Determine appropriate prevention, eradication, and control options for priority weed species. This task is accomplished by this plan. Potential eradication and control options for hot-list species that already occur at the CRWA are presented in Appendix F. Prevention, eradication, and control options should also be developed for hot-list species that have not yet invaded the CRWA.

Task 1.4.3. Implement species-specific weed management tasks in Appendix F.

Task 1.4.4. Evaluate the effectiveness of current methods and adjust methods as needed. Data from weed inventories will be used to carefully monitor and assess the effectiveness of current methods in light of management goals. The

results will be used to modify and improve control priorities, methods, and planning. Where necessary, monitoring data will also be used to establish new goals.

Biological Goal 1.5. Encourage and participate in an integrative, watershed level weed management plan for the Pope Creek watershed.

It will be difficult to prevent the continued introduction and spread of noxious weeds if neighboring landowners do not have the same management goals as the Department. Over the long term, the Department's costs for weed management will be less if cooperative ventures can be initiated to manage weeds at the watershed scale. Watershed-level weed management will be a complex task because the CRWA includes only a small fraction of the Pope Creek watershed, and the entire watershed encompasses lands managed by many private landowners and several public agencies. Nevertheless, some coordination is possible and may be spearheaded by groups or agencies other than the Department (e.g., Napa County or the BRBNA Conservation Partnership). The Department will encourage and participate in such coordination.

Task 1.5.1. Coordinate weed management with neighboring property owners and land managers. Weed control will be most efficient and economical if infestations on neighboring properties, particularly those upstream along Pope Creek and Maxwell Creek, are eradicated and controlled, and monitoring is sufficient to prevent the invasion and spread of new weed species. One possible solution is for all neighboring landowners in the area to work cooperatively by having monitoring and eradication conducted by the same entity. Such coordination could take place under the auspices of the BRBNA Conservation Partnership or the Napa County Weed Management Area (which is currently being organized).

Biological Goal 1.6. Restore native species and plant communities to increase resistance to and resilience against invasion.

Restoration measures may include reintroductions of native species, eradication and control of invasive species, inoculations with soil biota important to native plant vigor, nutrient cycling, and decomposition (e.g., mycorrhizae, found by Edgerton-Warburton and Allen (2000) to be important to the recovery of native bunchgrass species), and restoration of native disturbance regimes (Soulé and Terborgh 1999). Such measures are important to effective weed management because native abundance may increase resistance to invasion, especially at the scale of an individual patch of plants (Levine et al. 2002, Gelbard 2003). For example, plots dominated by established monocultures of the native perennial grass, *Nassella pulchra*, along with the late season annual forbs, hayfield tarweed (*Hemizonia congesta*) and woolly-headed lessingia (*Lessingia hololeuca*) resisted invasion by yellow starthistle (Dukes 2002). These species, like starthistle, complete their life-cycles late in the growing season and utilize deep soil moisture, suggesting that plant communities are most resistant to invasion where they

contain a high abundance of native species with similar life-history characteristics to introduced exotics (Roché et al. 1994, Enloe et al. 2000, Dukes 2001, 2002).

In the short term, weed eradication efforts at CRWA will focus on small infestations, and may not need to be followed up with native species restoration. However, as resources become available to control larger infestations, such as tamarisk and medusahead, native species restoration will become an integral part of vegetation management.

Task 1.6.1. Incorporate planting of native woody species (willows and cottonwoods) into plans for tamarisk eradication along Pope Creek.

Biological Goal 1.7. Maintain natural fire frequency, seasonality, and intensity with fire suppression or prescribed burning as necessary.

Task 1.7.1: Conduct research on the fire history of the CRWA to estimate historic and prehistoric fire frequencies.

Task 1.7.2: Coordinate with the California Department of Forestry and Fire Prevention to develop a wildland fire response plan and prescribed burn plan for the CRWA.

Task 1.7.3: To insure the proper implementation of the fire response plan, designate Department staff members with responsibility to coordinate with incident commanders and on the ground fire crews in the event of a wildfire at the CRWA.

Biological Goal 1.8. Maintain natural sediment movement through the watershed by mitigating unnatural erosion and by allowing natural stream bank dynamics in Maxwell and Pope Creeks.

Task 1.9.1: Identify and prioritize human-induced sources of erosion (e.g., dams, roads, trails, and firebreaks).

Task 1.9.2: Abate high priority erosion sources with earthmoving and by revegetating with native species as necessary.

Biological Element 2: Priority vegetation types.

High priority vegetation types at the CRWA are those that harbor a disproportionate fraction of biodiversity, particularly of rare or endemic species, are particularly susceptible to invasion by non-native species, or have been particularly degraded by past human disturbance and invasion by non-native species.

Biological Goal 2.1: Protect and restore native species biodiversity in two priority vegetation types: (1) serpentine grasslands and seeps, and (2) riparian areas.

Task 2.1.1. Continue and expand implementation of control or eradication plans for the five highest priority invasive species: barbed goatgrass, tamarisk, teasel, and tree-of-heaven, and yellow starthistle.

Task 2.1.2. Develop control plans for the medium priority invasive species: medusahead.

Task 2.1.3. Develop and implement plans for restoration of native plant communities with particular focus on expanding the cover of woody riparian species and native bunch grasses.

Biological Element 3: Special status species: plant and animal.

Special status species occur in a variety of vegetation types at the CRWA. Most special status plants occur on serpentine substrates in grasslands, seeps, or rock outcrops (barrens). Special status animals, including those that have been observed (northwestern pond turtle) and others that are likely to occur (foothill yellow-legged frog, Cooper's hawk) rely on streams and riparian vegetation. Foothill yellow-legged frogs rely on open, rocky stretches of stream with riffles and sunny banks. This type of stream habitat may be reduced both by invasive species such as tamarisk and perennial pepperweed, and by planting of native woody riparian species such as willows and cottonwoods. Western pond turtles prefer deep slow moving water in creeks and ponds. Prior to any management activities in riparian zones, surveys should be conducted for species with special status.

Priority vegetation types were defined in part by their diversity of special status species, so management actions that protect and restore native biodiversity in priority vegetation types should also provide protection for most special status animal species.

Biological Goal 3.1. Protect and enhance habitat for special status plant species.

Task 3.1.1. Direct public use activities away from serpentine rock outcrops (barrens), seeps, or other areas that harbor special status plants.

Task 3.1.2. Periodically visit populations of special status plants to assess overall habitat integrity and to detect the appearance of non-native species.

Biological Goal 3.2. Protect and enhance habitat for special status animal species.

Task 3.2.1. Conduct surveys for foothill yellow-legged frogs.

Task 3.2.2. Conduct surveys for western pond turtles and improve and protect upland breeding habitat for Western pond turtles by locating and protecting nesting areas.

Task 3.2.3. Improve pond and stream habitat for western pond turtles by eradicating tamarisk from Maxwell Creek and by controlling it in Pope Creek.

Task 3.2.4. Conduct surveys for avian species.

Management Constraints on the Biological Elements—The goals of the biological elements are constrained by a range of natural and human-induced factors. Effective management of the wildlife area requires that these factors be identified and considered. This plan recognizes that the Wildlife Area exists within the context of conflicting values and needs that are important to the neighbors of the Wildlife Area, the users of the Wildlife Area, and the people of California in general. Factors that affect the ability of the Department to attain the Biological Element goals include:

Environmental factors

- Proper ecosystem function has been impaired by a history of human impacts extending back at least 150 years. Many of these impacts are irreversible including changes to Pope Creek that have been caused by construction of Lake Berryessa and Pope Canyon Road.
- Many invasive species have become integrated into the California flora. Certain non-native annual grasses and forbs will always be present in grasslands, the oak woodland understory, and along riparian corridors.

Legal, political, or social factors

- Watershed-scale management will be constrained by the willingness or ability of other public land managers and private landowners to cooperate. The Department manages only a small fraction of the land within Pope Creek watershed, and most land within the watershed is privately owned. Private land owners may place values on their land that conflict with the goal of healthy ecosystem function. Other public land management agencies have missions and goals that differ from the Department. For example, managers of BLM land may be constrained by a multiple-use mandate that provides for commercial uses (e.g., mining or wind energy development) of the land.

Financial factors

- Limited funding for staffing and operations is the greatest existing management constraint for the Wildlife Area. This Plan proposes management actions that would require an increase in funding. In particular, organizing cooperative efforts to manage at a watershed scale probably requires substantially more resources and staff time than the Department can allocate to the CRWA.

❖ Public Use Elements

Public Use Element 1: Compatible public use.

The overarching public use element is termed "compatible public use." Compatible public use refers to all uses that are consistent with the mission of the Department, the purpose of the Wildlife Area, as well as all goals for biological elements. These uses are generally low-impact recreation activities defined in Chapter VI, and include hiking, hunting, wildlife observation/photography, primitive camping, and limited horseback and bicycle riding. Compatible public uses also include limited academic research and environmental education.

Compatible public uses have been allowed since the acquisition of the CRWA, but information about the availability of and restrictions on recreation opportunities have not been readily available to the public. Preventing incompatible uses and damage to the CRWA depends on informing the public about compatible uses at the CRWA. Making information available to the public in multiple forms, and combining information with that provided by other public agencies with land in the region will maximize effectiveness of outreach efforts.

Public Use Goal 1.1: Support compatible public uses and reduce or prevent incompatible uses with public outreach, signage, and regulations.

Task 1.1.1. Identify compatible public uses with signage at major access points to the CRWA and on the Department web site.

Task 1.1.2. Develop a brochure and map for the CRWA. Coordinate with the BLM and BOR to develop a multi-agency brochure for the CRWA, the Cedar Roughs Wilderness Study Area and the Pope Creek arm of Lake Berryessa. The brochure should replace the existing brochure produced by BLM and should include a topographic map showing existing routes on public land and clearly identifying and discouraging trespass onto private land. The brochure should be made available on the Department web site, at the Lake Berryessa Visitor Center, and at major access points to the CRWA.

Task 1.1.3. Coordinate with other agencies in the BRBNA to develop a BRBNA recreation brochure and map delineating land management units and allowed uses within these units.

Task 1.1.4. Consider amending the regulations for the CRWA to permit hike-in camping.

Task 1.1.5. Review regulations for the Wildlife Area to ensure that they are supportive of the goals of this plan.

Public Use Element 2: General public access.

The goal of the Department is to improve public access for compatible uses of the CRWA and for the CRWA to act as means of access to the BLM's Cedar Roughs WSA. Currently access to the CRWA is hindered by a lack of signage along Pope Canyon Road (posted signs have been repeatedly vandalized) and the lack of an official trail that connects to the Cedar Roughs WSA from the Lake Berryessa Unit. In the rainy season, access from Pope Canyon Road is further hindered by the need to ford Pope Creek, and because the two CRWA Units are separate, this requires two separate crossing points.

Currently, there is interest within the BRBNA Conservation Partnership in developing regional trails within the BRBNA, which could cross the CRWA. The Department will cooperate in planning such a trail systems and will focus on using existing routes if possible.

Public Use Goal 2.1: Maintain and expand opportunities for appropriate public access.

Task 2.1.1. Improve signage for the CRWA along Pope Canyon Road.

Task 2.1.2. Work with the BLM, the BRBNA Conservation Partnership and trail groups to explore the feasibility of developing an access trail that joins the ridge trail shown in the BLM's 1988 Cedar Roughs Wilderness Study Area Management Plan. Such a trail would fulfill a primary purpose of the CRWA, which is to provide legal public access to the Cedar Roughs WSA.

Task 2.1.3. Work with the BRBNA Conservation Partnership and trail groups to identify additional potential regional trail routes through the CRWA.

Public Use Element 3: Hunting and other wildlife-dependent recreation.

Hunting is a primary use of the CRWA. The Department is committed to providing long-term opportunities for deer and upland game hunting at the CRWA as well as to increasing opportunities for other wildlife-dependent recreation (e.g., wildlife photography, bird watching).

Public Use Goal 3.1: Provide long-term opportunities for hunting and increase opportunities for wildlife-dependent recreation.

Task 3.1.1. Coordinate with non-profit groups that promote wildlife-dependent recreational or hunting opportunities that can provide additional support to the Department's management of CRWA.

Public Use Element 4: Scientific research and monitoring.

Scientific information forms the basis for good management decisions at the CRWA. The Department can improve its management of the CRWA by conducting its own research and monitoring at the CRWA, and by soliciting partnerships with academic institutions.

Because of its proximity to several biological field stations the CRWA has potential to serve as a field site for academic research and instruction in the environmental sciences. The Department will evaluate the compatibility of proposed research projects based on the following criteria:

- potential for research results to improve management of the CRWA or other wildlife areas.
- potential conflicts between the research and compatible public uses.
- potential conflicts between the research and any biological goals stated in this Plan.
- potential contribution of the research to science and society.
- potential for the research to interfere with or preclude certain types of future research at the CRWA.

Public Use Goal 4.1: Support appropriate scientific research.

Task 4.1.1. Review and evaluate proposed research projects utilizing the criteria listed above.

Public Use Element 5: Environmental education and group activities.

Environmental education is a compatible public use of the CRWA. Local organizations and special interest groups are already accessing the Wildlife Area for group hikes and field trips.

Public Use Goal 5.1. Support environmental education use of the CRWA through staff assistance, interpretive materials and the provision of permits for group activities.

Task 5.1.1. Encourage all environmental education and natural resource interpretation (nonformal education) users to incorporate the Department's Natural Resource Education Messages guidelines in their field environmental education activities, curriculums, and interpretive programs, both on and off-site.

Public Use Goal 6.2 Provide additional appropriate natural resource interpretive opportunities if public demand reaches a significant level.

Task 6.2.1. Determine the feasibility of using local volunteers to conduct onsite interpretive and recreational use orientation sessions to maximize the awareness and appreciation of the wildlife area.

Task 6.2.2. Develop interpretive and site orientation signage that reflects wildlife area management objectives for recreation and resource management

Task 6.2.3. If public usage reaches a significant level of demand, develop a more formal interpretive plan element in the management plan

Management Constraints on the Public Use Elements—The goals of the public use elements are constrained by a range of natural and human-induced factors. Effective management of the wildlife area requires that these factors be identified and considered. These factors include:

Environmental factors

- Compatibility of public uses with biological goals depends on the intensity of use and the number of users. Uses that have negligible impacts on biological goals at current levels may have negative impacts at higher levels. Uses that are currently considered compatible may have to be curtailed in the future if they cause degradation of vegetation, erosion, or declines in populations of sensitive species.

Legal, political, or social factors

- Different public uses have the potential to conflict with one another, especially if overall use of the CRWA increases in the future. If conflicts develop, uses may need to be segregated in space and time or some uses may need to be restricted.

Financial factors

- Limited funding for staff and operations is a major constraint on management for public use. Public use goals and tasks were formulated under the assumption that the Department has the funding to undertake these tasks.

❖ Facility Maintenance Elements

The effective management of the CRWA will require that a regular maintenance program be established to meet the goals of the biological and public use elements. This plan defines an overall maintenance element, which identifies the basic direction that such a program should take and the components it should include.

Facility Maintenance Element 1: Facilities to support and manage public use.

Facility Maintenance Goal 1.1. Trails: maintain existing access routes through the CRWA; remove and remediate routes that encourage trespass onto private land.

Basic "trail" maintenance is necessary to support public use of the Wildlife Area, and some trail remediation may be necessary to discourage trespass onto private land

Task 1.1.1. Maintain existing routes (identifiedin the Public Use Goal 2.1) by periodic trail clearing.

Task 1.1.2. If additional access routes are constructed as a result of the tasks for Public Use Goal 2.1.2, then these trails will require a similar program of maintenance.

Facility Maintenance Goal 1.2. Maintain and improve signage that identifies all accessible boundaries of the CRWA, informs the public of laws and regulations applicable to the CRWA, provides interpretive and safety information, and discourages trespass onto private lands.

Signs are the primary means by which the Department may inform users about the Wildlife Area. Currently signage is limited to just a few that identify the boundary of the Wildlife Area. Additional signage is necessary to fully mark Wildlife Area boundaries, and to provide information about Wildlife Area regulations, geography, safety, natural and cultural history, and management activities.

Task 1.2.1. At each unit, install a kiosk or bulletin board with wildlife area maps and regulations, interpretive material, and safety information.

Task 1.2.2. Start a monitoring and maintenance schedule for all signage.

Task 1.2.3. Inventory existing boundary signage, and install new signs where necessary.

Facility Maintenance Goal 1.3. Improve parking along Pope Canyon Road.

Task 1.3.1. Explore the feasibility of constructing a gravel parking lot off of Pope Canyon Road. A cultural resources survey has already been completed for a potential parking area at the Lake Berryessa Unit along Pope Canyon Road. Explore the feasibility of constructing a gravel parking lot in this location.

Facility Maintenance Goal 1.4. Secure the CRWA from vehicular trespass.

Uncontrolled vehicle traffic can result in erosion and damage to vegetation, particularly in riparian areas and seeps. The CRWA is largely protected from vehicle incursions by natural barriers (Pope Creek, steep terrain, and dense woody vegetation), however some vehicle trespass occurs from adjoining private parcels. These entry points must be barricaded, signed, and monitored to protect vegetation and wildlife habitat.

Task 1.4.1. Survey likely entry points for signs of unauthorized vehicle access.

Task 1.4.2. Install signage and barriers as needed.

Task 1.4.3. Coordinate with the BLM to control vehicular access through BLM land.

Facility Maintenance Goal 1.5. Remove remnants of recent human activity (abandoned structures or fences, etc), provided that such remnants have no historical or management value.

The CRWA contains signs of past human use including the remains of a barn or cabin and a homestead or campsite. Some of these remains may constitute a safety hazard for the public or may attract vandalism. Removal of such remains will remove these risks and increase the wilderness value of the CRWA.

Task 1.5.1. Inventory remains of recent human activity.

Task 1.5.2. Assess the value of existing structures as habitat for bats.

Task 1.5.3. Determine which improvements may have management or historic value.

Task 1.5.4. Remove all improvements with no management or historic value.

Facility Maintenance Element 2: Cultural resources.

A single cultural resources survey has been conducted within the CRWA (Haydu 2004b), which focused on Dollarhide Road and a portion of the Lake Berryessa Unit on either side of Pope Creek. No significant cultural resources were found within the CRWA in this survey, but two Native American and one historic-period archaeological resources have been recorded within two miles of the CRWA. Significant cultural resources may exist within the CRWA in areas that were not surveyed, including subsurface deposits that have no surface manifestation.

Human activity on the CRWA has been continuous since prehistoric occupation and many remnants of more recent human activity may not constitute significant cultural resources. Some remnants of human activity may need to be removed or disturbed because of safety hazards, aesthetic impacts, or conflicts with other management goals. Whenever an action with potential impacts on cultural resources is contemplated, Department staff will follow a standard procedure to evaluate the significance of the resource, and to determine whether the potential impact is acceptable or requires mitigation. The California Register of Historic Resources (CRHR) serves as a guide to cultural resources when there is a discretionary action subject to the California

Environmental Quality Act, and also serves as a guide for management of the CRWA. The CRHR lists criteria for evaluating the significance of cultural resources and their eligibility for listing in the Register (Haydu 2004a). Adverse effects to cultural resources eligible for listing will be avoided or the effects mitigated.

Facility Maintenance Goal 2.1. Catalog and preserve all cultural resources that have yielded or have the potential to yield information important to the prehistory or history of the CRWA or that otherwise meet significance criteria according to the CRHR.

Task 2.1.1. Conduct additional cultural resource surveys as necessary. Cultural resource surveys will precede all activities with the potential to disturb cultural resources.

Task 2.1.2. Conduct cultural resource surveys and encourage academic archaeological research in coordination with prescribed fire and immediately after natural fires. By removing herbaceous and shrubby vegetation, fire greatly increases the effectiveness of cultural resource surveys. To the extent possible, cultural resource surveys should be conducted immediately after fires have occurred.

Management Constraints on Facilities Maintenance Elements—The goals of the facilities maintenance elements are constrained by a range of natural and human-induced factors. Effective management of the wildlife area requires that these factors be identified and considered. These factors include:

Environmental factors

- Maintenance requirements will depend largely on the severity of winter weather conditions. In years of exceptional rainfall, flooding or erosion may damage roads, fences, and signage, and the degree of damage will dictate maintenance needs and priorities.

Legal, political, or social factors

- The addition of signing, access improvements will result in public expectation for the maintenance of these improvements. Some of these improvements may attract vandalism. The frequency and severity of vandalism may impact the Department's ability to maintain the improvements or to continue to provide them over the long term.

Financial factors

- As with other elements, limited funding for staff and operations is a major constraint on facilities maintenance. Full realization of the facilities maintenance goals will require an increase in funding for the wildlife area.

❖ Management Coordination Element

Many of the biological, public use, and facility maintenance elements and goals require coordination with other public agencies or private landowners. This section describes specific actions that the Department can take to facilitate such coordination. The BRBNA Conservation Partnership should serve as the focal point for management coordination, because all of the agencies managing public lands in the vicinity of the CRWA as well as many private landowners and interest groups are active participants in the partnership.

Management Coordination Goal 1: Participate in ongoing management coordination with the Blue Ridge Berryessa Natural Area Conservation Partnership.

Task 1.1. Maintain active participation in the BRBNA Conservation Partnership by having at least one Department representative attend each (approximately) monthly meeting.

Task 1.2. Consider the feasibility of assigning a Department representative to serve on the BRBNA Stewardship Committee.

Management Coordination Goal 2: Coordinate signage with managers of adjacent public lands and owners of adjacent private lands.

Several facilities maintenance goals call for improving signage around the boundaries of the CRWA. In most cases this will be most efficient if signage is coordinated to indicate transitions between different land management agencies or to private property.

Task 2.1. Maintain contact with managers of adjacent public lands and owners of adjacent private lands. Discuss mutual signage needs and share labor and materials when possible.

Management Coordination Goal 3: Coordinate with other law enforcement agencies.

Law enforcement jurisdictions at and around the CRWA overlap with the Napa County Sheriff's Department, the BOR, the BLM, and the California Highway Patrol. Law enforcement is limited at the CRWA due to its rugged terrain and lack of vehicle access. Greater effectiveness in enforcing laws and regulations at the CRWA can be achieved by coordination with these other entities.

Task 3.1. Meet with law enforcement staff from Napa County, BLM, and other agencies as appropriate to coordinate law enforcement activities and explore options for cooperative programs.

Management Coordination Goal 4: Coordinate with local public service agencies.

Several public service agencies, including the Napa County Road Department and the California Department of Forestry and Fire Protection (CDF) provide service in and around the CRWA. The Napa County Road Department maintains Pope Canyon Road, which is the primary access to the CRWA. CDF is the primary agency responsible for fire protection services for the CRWA and surrounding private and public lands. Coordination with these agencies is necessary to ensure that their activities are consistent with the goals of this Plan.

Task 4.1. Work with CDF to develop a fire response plan consistent with the goals of this plan and the protection of private property and public safety. Currently there is little evidence that fire frequency is abnormally high at the CRWA, so in the short term the biological goals of this plan may be best met by taking a less than fully aggressive approach to fighting wildfires in the CRWA. For example, the negative impacts of using bulldozers to cut fire lines (i.e., erosion and spread of invasive species) may outweigh and benefits of containing a fire more quickly as long as there is no threat to private property and public safety. In any case, existing fire breaks should be relied upon as much as possible and a fire response plan should identify the most appropriate areas to cut fire lines if necessary, and should identify sensitive areas where use of mechanized equipment should be avoided altogether.

Task 4.2. Communicate regularly with the Napa County Road Department to ensure that road maintenance activities are consistent with the goals of this plan. In particular, work with the Road Department to ensure that maintenance of and improvements to Pope Canyon Road minimize the potential for erosion and the introduction of invasive species.

Management Constraints on the Management Coordination Element—The goals of the facilities maintenance elements are constrained by a range of human-induced factors. Effective management of the wildlife area requires that these factors be identified and considered. These factors include:

Legal, political, or social factors

- The public and private entities that manage property in the Pope Creek watershed have different missions, objectives, and procedures that must be considered and accommodated. These differences may constrain the degree of cooperation possible.

Financial factors

- Management coordination is intended to increase the efficiency of attaining the goals of this plan. Nevertheless, coordination will require initial and ongoing investment of staff time, the availability of which will depend on funding.

VII. OPERATIONS AND MAINTENANCE

The implementation of the Plan will require additional staffing and resources to accomplish the Tasks that are established in Chapter VI. The Cedar Roughs Wildlife Area is not currently assigned specific staff time or budget. This Plan proposes proactive ecosystem management of the CRWA and potentially of the entire Pope Creek watershed at a level that is more intensive than in the past. The will require a commitment of additional budgetary resources if the goals of the Plan are to be achieved.

In addition to financial resources, this Plan will need to be kept current and revised as necessary to respond to changing situations. It is expected that ongoing adaptive management of the CRWA and advancement of scientific knowledge regarding invasive species control and restoration of native vegetation will result in new techniques and opportunities for more effective management of the CRWA. Procedures to help keep this Plan current and relevant are included in this Chapter.

❖ Existing Staff and Additional Personnel Needs

Currently no Department staff positions are specifically budgeted to the CRWA. Existing staff positions do, however, provide services to the Wildlife Area including the following:

- Approximately 5% of an Associate Wildlife Biologist's time

This time is primarily spent participating in monthly meetings of the BRBNA Conservation Partnership, and occasional site visits to the WA for initial invasive species control efforts and posting signage.

To adequately support the Wildlife Area and to perform the tasks identified in this Plan, additional staffing is required. The staffing program proposed in this Plan incorporates permanent positions (Personnel Years [1.0 PY= 1920 hours]) supplemented by seasonal staff.

Program Management—Associate Wildlife Biologist position (0.25 PY)

This individual will serve as the manager of the Wildlife Area, perform technical tasks and give direction to maintenance staff. The individual will serve as the Department's principal representative to the BRBNA Conservation Partnership and in coordinating management with other private and public entities. This person will have principal responsibility for implementation of this Plan.

Site Management—Habitat Supervisor I position (0.1 PY)

Occasional field operations will require a Habitat Supervisor I position. The individual will perform the facility maintenance or biological tasks described in this Plan. The individual

will work under the Associate Biologist assigned to the WA and potentially direct any seasonal staff and/or volunteers performing tasks as described by this Plan.

Maintenance—Scientific Aid position (0.25 PY).

Under the direction of either the Associate Biologist or the Habitat Supervisor I, one seasonal Scientific Aid position will perform tasks related to signing, access improvements, control of invasive species, restoration, and other habitat improvement projects.

Law Enforcement—Fish and Game Warden (0.1 PY)

The periodic presence of a Fish and Game Warden will be required to patrol the Wildlife Area to protect natural resources. The individual will provide a presence to deal with fish and game violations and enforce other Wildlife Area regulations including those related to vehicular use and vandalism. The individual will also assist Wildlife Area neighbors with concerns regarding trespass and vandalism.

❖ Operations and Maintenance Cost

The proposed staffing of the Wildlife Area and the requirements of an annual operations and maintenance budget has been evaluated in order to establish the annual cost of the operation of the Wildlife Area.

Staffing

The annual cost of the proposed needed staffing is as follows:

Position	PY's	Yearly Salary	Total Salary
Associate Wildlife Biologist	0.25	$ 61,524	$ 15,381
Wildlife Habitat Supervisor I	0.1	48,876	4,888
Scientific Aid	0.25	25,866	8,622
Fish and Game Warden	0.1	68,220	6,822
Total Staffing Salaries			**$ 35,713**

Materials and supplies

A materials and supplies budget will be required to provide office supplies, materials, fuel, and small tools, etc. to support management and maintenance activities. To some extent equipment and materials could be shared from other Department of Fish and Game managed areas. Specific materials would include replacement signs, fences and gates, herbicide, gravel, etc., This does not include larger projects such as the construction of a parking lot. That would need separate funding not considered here. Estimated annual budget; $25,000.

The total annual cost (salary, benefits, materials and supplies) is estimated to be approximately $60,000.

❖ Future Revisions to this Plan

All planning documents eventually become dated and require revision so they can continue to provide practical direction for operational activities. A common and unfortunate situation is that the revision of planning documents is often neglected because the process for revision is considered too involved and too cumbersome. To address this problem, this Chapter incorporates a hierarchy of revision procedures in which the level of process and required involvement is proportionate to the level of change that is proposed. This Plan reflects the best information available during the planning process, but it is understood that new information will become available over time and there will be the need to make adjustments to keep this Plan current. Such new information may include any of the following:

- Feedback generated by monitoring results of management activities (adaptive management).
- Other scientific research that directs improved techniques of management.
- Documented threats to biotic communities, habitats, or wildlife species.
- New legislative or policy direction.

When the new information dictates a change to this Plan, it is important that there is an appropriate process established. Public outreach and public input will be necessary in proportion to the proposed change to the policy established by this Plan. Unless a clear revision process exists, this Plan, like plans in many organizations will become outdated and irrelevant.

Minor Revisions—A process is required to accommodate minor revisions to this Plan that may include the addition of new property to the Wildlife Area or the adoption of limited changes to the goals and tasks as a result of adaptive management, other scientific information, or legislative direction. This procedure will be applicable to revisions that meet the following criteria:

- No change is proposed to the overall Purposes of this Plan
- CEQA documentation (if required) is prepared and approved.
- Appropriate consultation within the Region and with the Lands and Facilities Branch occurs.
- Appropriate consultation with other agencies occurs.
- Adjoining neighbors are consulted regarding the revision, if the revision is related to a specific location or the acquisition of additional area.
- An information presentation regarding the proposed revision is made to the BRBNA Conservation Partnership.

The Minor Revision may be prepared by the staff assigned to the Wildlife Area or with other Department resources and requires approval by the Regional Manager.

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